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ACKNOWLEDGEMENT

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Advancement of Dengue Virus Vaccine: Progress and Challenges

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The dengue virus (DENV), which causes dengue, infects 100 to 300 million people globally each year [1]. *Aedes aegypti* mosquitoes carry the Dengue virus, which causes dengue fever, which is still a serious global health risk, particularly in tropical and subtropical areas [2]. Since there are now no targeted antiviral therapies and due to difficulties with traditional vector control techniques, the focus has shifted to developing vaccines as the main preventive measure. In order to create a variety of vaccination forms, including live attenuated, recombinant subunit, inactivated virus, viral vectored, DNA, and mRNA vaccines, scientists have targeted E protein and NS1.

An important advancement in the fight against Dengue fever has been the development of vaccinations that are able to neutralize all four serotypes. But there are obstacles such as lack of vaccine effectiveness against specific serotypes, side effects produced by vaccine in progeny and vaccine-induced immunological enhancement (ADE).Immunization can lessen the burden on healthcare systems, lower the number of hospitalizations caused by dengue, and help stop outbreaks.

The development and implementation of dengue vaccine research are significantly accelerated by international cooperation, public-private partnerships, and regulatory cooperation. Effective programs show how crucial it is to work together to combat dengue fever on a worldwide scale. The difficulties involved in developing a dengue vaccine, ongoing funding, campaigning, and research are crucial. There are several viable approaches to increase the efficacy and accessibility of the Dengue vaccine, including cross-disciplinary cooperation, novel vaccination platforms, and emerging technology.

In conclusion, overcoming obstacles unique to each serotype, embracing creative approaches to vaccine design, and negotiating scientific intricacies are all necessary steps on the path to developing successful Dengue virus vaccines. The convergence of state-of-the-art technologies, computational modeling, and cooperative research endeavors can potentially realize the objective of vaccination-based comprehensive dengue prevention.

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Original Article

Evaluating Communication through Work Authorization between Dentists and Dental Technicians for Fixed Prosthesis

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ABSTRACT

Communication within the dental profession can be challenging and may affect the quality of prostheses delivered to the patient. A methodical investigation into the dynamics between dentists and dental technicians is lacking in Lahore. **Objective:** To assess adequate practice of communication between dentists and dental technicians through work authorization for fixed prosthesis. **Methods:** This cross-sectional study was conducted in dental laboratories of Lahore. A questionnaire concerning work authorization forms was distributed to 80 dental technicians through Google Forms and hard copies. The survey concentrated on inquiries related to various aspects of work authorization, including gender, years of experience, impression disinfection, patient demographic data, impression materials used, fixed prosthesis design, and shade selection. An adequate work authorization was assessed in the end. Statistical analysis was conducted SPSS version 25.0 and was analyzed using chi-square, with significance set at $p \leq 0.05$. **Results:** Out of the 80 survey forms disbursed, only 73 completely filled responses were accepted, giving a response rate of 91%. Information regarding patient demographic data (19.2%), patient photographic record (5.5%), pontic design (13.7%), margin design (37%), surfaces covered by metal (9.6%) and occlusal scheme (6.8%), were all on the inferior side of the scale ranging below 40%. Adequate practice of work authorization was discouraging, at only 17.8%. **Conclusions:** Poorly filled work authorization forms lead to patient and dentist dissatisfaction with fixed dental prostheses. This highlights the importance of clear communication between technicians and dentists. Dental students should learn to complete these forms during their training.

INTRODUCTION

Communication involves exchanging information verbally or non-verbally, which can include speech, writing, charts, maps, and images [1]. People use these channels to achieve mutual understanding between the sender and receiver of information. Communication within the dental profession can be challenging due to the diverse roles within dental offices, including dental assistants, hygienists, and administrative staff. Similarly, dental laboratories involve technicians along with various support personnel like delivery staff, technical advisors, and marketing professionals [2]. Effective communication is vital in dentistry for collaborative success. However, inadequate dentist-technician communication can lead to quality, time, and cost issues, impacting patient satisfaction [3]. Dentists often attribute permanent prosthesis remakes to lab errors, even with accurate prescriptions, as labs may deviate from desired materials and procedures due to misinterpretation. Some dentists delegate form completion to assistants, leading to communication errors and clinically significant issues like inadequate prostheses [4]. Digital impression techniques, introduced in the 1980s, offer an alternative to conventional

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methods, revolutionizing fixed reconstructions with CAD/CAM technologies. However, their prevalence remains low in Pakistan [5, 6]. By developing constructs directly on a computer screen and eliminating actual working models in the process, computer technology has altered the manufacturing process [7]. Sadly, their prevalence of use is yet to catch up in Pakistan. Traditionally, dentists conveyed their needs to technicians through handwritten prescriptions, establishing unidirectional communication. However, the adoption of work authorization forms, which are detailed orders specifying the work to be done and materials to be used, streamlines communication and minimizes the likelihood of mistakes [8]. Hence, enhancing communication avenues, such as standardized work authorizations, is imperative for ensuring effective dental procedures. The Medical Devices Directive (Directive 93 / 42 / EEC) of the European Union affirms that the dental practitioner bears the obligation of giving the dental technician precise instructions[9].

There is not much data about laboratory communication in Pakistani local settings. Communication through work authorization forms between dentists and technicians in private laboratories and dental colleges remains unexplored in Lahore. The objective of the research was to assess the adequate practice of communication between the dentist and dental technician through work authorization by looking at specific areas for fixed prostheses. The rationale is that the study will underscore the need for the incorporation of work authorization forms in the BDS curriculum.

METHODS

This cross-sectional research was conducted from October 2023 till January 2024, after obtaining approval from Institutional Review Board of Lahore Medical and Dental College, FD/1499/24. The study was confined to dental technicians of Lahore who fabricated fixed prostheses, with dental technician students being excluded. These technicians worked in various locations such as commercial dental laboratories or laboratories associated with dental colleges. The survey was prepared after a review of the literature and discussions with subject experts. There were only a few short and straightforward survey questions. They were left with only two possibilities, not a multitude of options. This facilitated faster and easier responses from participants, resulting in more accurate data for the study. It was then validated after conducting a pilot study. The researchers employed the non-probability convenience sampling method and determined the sample size using a formula derived from the WHO calculator. For this study, a 95% confidence level was chosen, with the desired margin of error at 2%, while maintaining the power of the test of 80%. Therefore, a sample size of 81 was calculated. A self-administered, closed-ended survey, through Google forms and hard copies, was distributed among the selected sample of dental technicians of Lahore. The participants' identities were kept confidential, and informed consent was obtained. After a week, a reminder was sent if they had failed to submit a response using online forms. The following aspects of work authorization were covered by the survey: gender, years of experience, impression disinfection, impression materials used, fixed prosthesis design, and shade description. An adequate work authorization was assessed in the end. SPSS version 25.0 software was used for data analysis, and statistical methods for data collection and analysis were followed. To compare proportions across various parameters, cross-tabulation analysis was performed using the Chi-square test for association. When determining associations, a p-value of less than 0.05 was deemed statistically significant.

RESULTS

Out of the 81 survey forms disbursed, only 73 completely filled responses were accepted, giving a response rate of 90%. Incomplete forms along with un-submitted responses were discarded. Table 1 states the frequency of the recorded data along with responses. The mean age of the dental technicians was 33.84 ± 10.6 years. 60 (82%) of technicians stated that alginate was the most common material used to record impressions by dentists, followed by rubber-based impressions with a count of 13(18%).

Table 1: Details of Participants and Frequency of Responses

S. No.	Demographics	Variables	Frequency (%)
1	Gender	Male	70 (95.9)
		Female	3 (4.1)
2	Experience	Less than 5 years	33 (45.2)
		More than 5 years	40 (54.8)
3	Technician certification	Achieved	26 (35.6)
		None	47 (64.4)
	Questions	**Reponses**	
		Yes	**No**
1	Was the master impression disinfected by the dentist?	57 (78.1%)	16 (21.9%)
2	Do dentists provide patient's information regarding age and gender?	14 (19.2%)	59 (80.8%)
3	Were photographs/diagrams provided by the dentist?	4 (5.5%)	69 (94.5%)
4	Was shade selection done by the dentist?	64 (87.7%)	9 (12.3%)
5	Was prosthesis type indicated (All metal/PFM/All ceramic/ Zirconia) by the dentist?	71 (97.3%)	2 (2.7%)
6	Was pontic design indicated?	10 (13.7%)	63 (86.3%)
7	Was margin design mentioned?	27 (37%)	46 (63%)

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8	Was the surface to be covered by metal mentioned?	7 (9.6%)	66 (90.4%)
9	Was occlusal scheme to be incorporated mentioned?	5 (6.8%)	68 (93.2%)
10	Is This an Adequate practice of work authorization?	13 (17.8%)	60 (82.2%)

Figure 1 demonstrates the frequencies of the method of communication adopted by the dental technician.

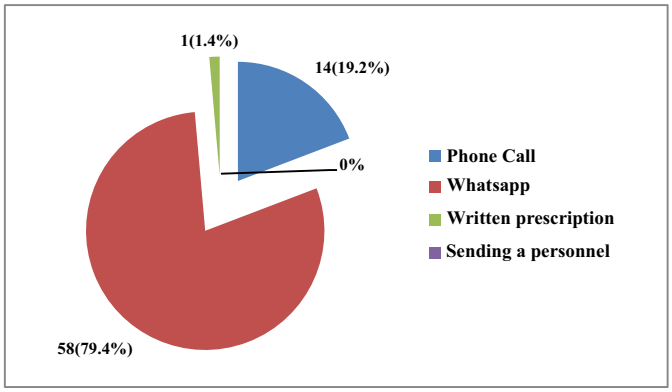

Figure 1: Frequencies of Method of Communication Adopted by the Dental Technician

Table 2 states the association amongst experience of technicians with their qualifications and adequacy of work authorization, respectively.

Table 2: Experience of Dental Technicians Associated with their Qualifications and Adequacy of Work Authorization

Experience of Dental Technicians	Qualification		p-value	Adequate Work Authorization		p-value	Total N (%)
	Achieved N (%)	None N (%)		Yes N (%)	No N (%)		
Less than 5 years	16	17	0.04	5	28	0.59	33
5 years or more	10	30		8	32		40

There was a significant association between the experience of dental technicians and their qualifications; that is technicians with less experience had qualifications rather than the more experienced participants who did not have a BS Dental Technology degree. There was no statistically significant association between the experience of dental technicians and adequate work authorization; that is, work authorization was inadequate in the opinion of both experienced and inexperienced technicians. In addition, it was observed that there was no significant association between experience and method of communication (p=0.54); that is, technicians of both experiences preferred Whatsapp as the favored method of communication with the dentists.

DISCUSSION

Effective communication between dentists and dental technicians is crucial for delivering high-quality prostheses to patients [10, 13]. The lack of communication has been identified as a major factor affecting the provision of optimal dental services [14]. The technician's main information source in the dental clinic is the dentist, highlighting the critical significance that good communication between them has in guaranteeing the caliber of dental prostheses [15]. Because of their different locations, even if they are close by, there are clear communication breakdowns between technicians and dentists when it comes to work authorization forms [16]. When dentists provide incomplete or unclear instructions to dental technologists for fixed prostheses, it ensues in unnecessary additional costs to them [17]. Work authorizations in dental laboratories have been identified as a commonly used yet often misused form of communication between dentists and laboratory technicians [12, 13, and 18]. This was highlighted by this research on dental technicians' perspectives of Lahore. It was found that crucial details on work authorization forms, such as demographic data of the patient, patient photographs, pontic and margin design, and surfaces to be covered using metal and occlusal schemes, were frequently deficient in dentists' submissions. Shetty et al., stated that fewer than 25% of the prescriptions received by dental technicians were clear enough to provide satisfactory service, which is similar to the findings of our study where we recorded 17.8% satisfactory work authorization forms [8]. Similarly, Elsawaay *et al.*, stated that 58% of dentists provided inadequate design to the technicians [19]. In contrast, Azzopardi stated they had a record of 56.2% satisfactory work authorization forms [1]. Dental technicians lack knowledge of basic facts of infection control protocols, according to surveys evaluating their comprehension of the topic [8]. The risk of cross-contamination within the dental clinic increases when the master impression is not adequately disinfected. In our study, 78.1% of impressions received were disinfected by dentists. This is in accordance with Eltawati *et al.*, where technicians received 85.5% disinfected impressions [20]. In our investigation, it was found that 82% of dentists were using alginate to record and send their impressions. This is in contrast to Elsawaay et al., where they stated that alginate for final impression was used in only 4.5% of cases [16]. Alginate is not advised to be used for fixed restorations because of dimensional instability. The dental technician relies on tooth shade information for accurate fabrication. In our study, 87.7% of dentists sent the selected shade for the prosthesis. When shade details were provided, they were often limited to a single tab shade. Similarly, Lone *et al.*, findings revealed that 90% of dental practitioners determined tooth shade using a traditional shade guide [19]. This is contrary to Shetty *et al's.*, finding where they had a response of 74% of dentists who did not provide it [8]. Effective pontic design is crucial for ensuring cleanability, optimal tissue health, and pleasing aesthetics [18]. In our study, only 13.7% of

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technicians confirmed that dentists sent them the pontic design. Similarly, Elsawaay *et al.*, stated in their study that only 19.7% of dentists always sent in the pontic design [16]. Emphasis has been placed on the significance of margin design to uphold oral hygiene and the patient's periodontal health. A poorly designed margin in a fixed prosthesis could promote plaque buildup, increase the risk of cavities, and contribute to periodontal issues. In our study, only 37% of dentists sent details of the margin design to the technician. This was contrary to the findings of Albahbah *et al.*, where they found that 71.5% did send the margin design to the technicians [18]. Several dentists, 93.2%, relied on technicians to accurately place casts in the proper occlusion, neglecting to provide any occlusal information. These outcomes are in contrast to the study of Elsawaay *et al.*, findings, where they had only 38% dentists who did not send in the occlusal scheme to the technician [16]. Many dentists are unaware that inadequate recording of the prepared teeth's occlusal surfaces is what leads to a successful restoration rather than a mistake by the technician. Wagner *et al.*, noted that technicians often resort to contacting dentists by phone for clarification on instructions, highlighting inadequate communication [17]. When faced with poorly filled work authorization forms, technicians prefer contacting dentists via WhatsApp (79.4%) followed by phone calls. No technician sent over personnel to the dentist most likely due to the hassle and added expense of transport for the personnel. WhatsApp offers convenience and instant sharing of pictures and video calls [1, 17]. However, Elsawaay et al., reported the phone (43%) as the most common communication method, followed by written prescriptions (24%) [16]. Verbal instructions may be forgotten; hence technicians prioritize written instructions for medico-legal reasons [1, 18]. It is important to take into account the limitations of this study when evaluating the findings. First of all, the findings were based on dental technicians' self-reported responses, which may introduce recollection bias and cause actual perceptions and behaviors to be over or underestimated. Furthermore, the study's sample was restricted to Lahore, which limits the applicability of the results on an international scale.

CONCLUSIONS

The dental team needs to understand each other's responsibilities to deliver high-quality fixed dental prostheses. Clear communication between dentists and technicians is crucial as currently a meager amount of dentists are fulfilling the forms. Educating dental students and recent graduates on the importance of work authorization is essential. The exercise of filling clear and concise work authorization forms should be included in clinical teachings of final year BDS programs and continuing education courses.

Authors Contribution

Conceptualization: AFB
Methodology: UWJ
Formal analysis: MUDA, AAB
Writing, review and editing: AFB, AQ

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Analyzing the Direct and Indirect Effects of Coping Self-Efficacy on Well-Being via Quality of Life

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ABSTRACT

Understanding the intricate interplay between coping self-efficacy, quality of life, and overall well-being is essential in exploring the factors that contribute to individual resilience and psychological thriving. **Objective:** To test coping self-efficacy's direct and indirect (through quality of life) effect on well-being. **Methods:** Using purposive sampling, data were collected from literate adults aged 18 and above in Pakistan. Sample (N=150), mean age=22.65 years consisted of 51 males (34%) and 99 females (66%). Informed consent was taken, and participants filled out the questionnaire consisting of the PERMA profiler, generalized self-efficacy scale, world health organization quality of life brief and demographic sheet. **Results:** Data analysis showed that coping self-efficacy positively affects well-being (B=3.98, p <0.01). The meditational model showed a significantly positive direct effect (B=.2.78, p >0.01) as well as the indirect effect of coping self-efficacy on well-being (B = 1.20, 95% CI = 0.46, to 1.90). These results show that having higher coping self-efficacy will have an accelerating effect on well-being. Similarly, coping self-efficacy also increases the quality of life, further increasing well-being. **Conclusions:** An individual's well-being increases in the presence of higher coping self-efficacy, and this relation is accelerated further in the presence of better quality of life. Thus, the quality of life and self-efficacy can be targeted in intervention programs to enhance well-being for living a more fulfilling life and to create more resilient citizens.

INTRODUCTION

PERMA is short for Positive Emotion (P), Engagement (E), Relationships (R), Meaning (M), and Accomplishment (A) [1]. It is a model of well-being that has gained consideration from researchers worldwide owing to its efficiency in predicting the flourishing of communities, organizations, groups, and nations [2]. This model of positive psychology offers a theoretical framework that takes into account various elements of well-being, i.e., positive emotion (feeling positive sentiments), engagement (being absorbed in life pursuits), relationships (having adequate relations with others), meaning (having a purpose and bigger goal), and accomplishment (regularly achieving successes) [1] . Well-being is a far better predictor of psychological distress than earlier reports of distress [1]. Due to its numerous health and psychological benefits, the construct of well-being has recently gotten the interest of researchers who are yet to explore its predictors and correlates. One study in South Korea explored the mediating role of well-being (using PERMA) on the quality of life of emergency workers and found that the better the PERMA of these workers was, the better their life satisfaction and quality of life were [3]. Another study also established the relationship between quality of life with PERMA. In an Irish study, higher levels of quality of life were also associated with greater well-being and resilience [4]. A study designed to develop the PERMA profiler as a measure of well-being based on the PERMA model of Seligman found a positive relationship between self-efficacy and well-being [5]. In a study, self-efficacy was found to be a significant positive predictor of well-being, accounting for a 22% variance in well-being [6]. Coping with self-efficacy is a vital aspect of socio-cognitive

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theory. Coping self-efficacy refers to the perception of positive and optimistic self-beliefs or a sense of subjective competence to deal effectually with various situations [7]. Self-efficacy is the conviction of a person concerning the making of the desired effect by means of their actions. It is the most esteemed constituent in the human agency and potentially plays the part of a rudimentary motivator to cope with any circumstances in the face of difficulties [8]. Most males report the poorest self-efficacy compared to females [9]. A high level of self-efficacy fortifies the individual's immune system by decreasing the release of hormones linked with stress, which improves psychological well-being [10]. One study emphasized the need for incorporating self-efficacy in the treatment plan for clients due to its high significance in contributing to their quality of life [11]. WHO terms quality of life as a condition entailing complete mental as well as social and physical well-being, not just the lack of disease. It is an individual's own perception regarding their position in life in the context of the culture, norms, and value systems in which they live and in relation to their standards, expectations, goals, and concerns [12]. Research on diabetics reported that self-efficacy could empower the patients and play the role of enhancer of quality of life. This research also found the strong predicting role of self-efficacy in increasing quality of life [13].

Based on the relationship between coping self-efficacy, quality of life, and well-being, it was hypothesized that coping self-efficacy will directly affect overall well-being. It was further hypothesized that the quality of life would mediate the effect of coping self-efficacy on well-being. Following these suppositions, the present study aimed to address two major objectives. Firstly, to test the direct and indirect (through quality of life) effects of coping self-efficacy on well-being. Secondly, to explore the relationship between demographic and study variables.

METHODS

A cross-sectional correlational research design was utilized to conduct the study. Purposive sampling was used to carry out the study. According to G*Power, for a model of one predictor with mediation of quality of life, an effect size of 0.015, a power of 0.95, and an alpha of 0.05, a total of 150 participants were calculated as sample size, and data were collected from literate adults aged 18 and above. The duration of the study was from December 2021 to September 2022. The sample's inclusion criteria were educated participants who could understand English and were at least 18 years old. Exclusion criteria included individuals below 18 years and individuals unable to comprehend English. They were excluded because the instruments used were in the English language. The participants were given an informed consent form to seek their willingness to participate. They were briefed about the objectives of the study. They were also assured about the confidentiality of their identities and responses. The sample's age ranged from 18 to 36 years, with mean age = 22.65 years (SD = 4.43) having an average of 14 years of formal education (SD = 2.35). The participants included 51 Males (34%) and 99 Females (66%). Most of the participants were unmarried (i.e., 84.7%) and had no current ailment (95.3 %). Most participants were students (77.3), whereas 22.7% were on the job. Most of the sample was from the joint family system (56 %), compared to the nuclear family system (44 %). PERMA profiler is a self-report scale of well-being using an 11-point Likert scale, having 23 items in total and eight subscales (3 items in each subscale except Loneliness subscale that consist of a single item), namely Meaning, Positive Emotion, Relationships, Engagement, Accomplishment, Negative Emotion, Loneliness, and Health [5]. Overall well-being is calculated using all the items other than the items in subscales, namely 'Negative Emotion', 'Health', and 'Loneliness', that are used as filler subscales. A high score on PERMA shows high overall well-being. The scale showed good Cronbach's alpha reliability (a =0.76). World Health Organization Quality of Life-Brief (WHOQOL-BREF) is a self-report scale measuring the quality of life [14]. It is a 5-point Likert scale that has 26 items and four subscales, namely psychological functioning (6 items), Environment (8 items), Physical health (7 items), and social relationships (3 items). The scale showed satisfactory Cronbach's alpha reliability (a = 0.89). Coping Self-Efficacy was measured via the generalized self-efficacy scale (GSES), having ten items that rate responses on a 4-point Likert scale. High scores on GSES indicate high coping self-efficacy [7]. The scale showed good Cronbach's alpha reliability (a =0.79). The preliminary analyses included Pearson correlation analysis, to study the correlation among demographic and study variables, and t-test for analyzing gender difference on study variables. Process macro by Hayes was utilized to carry out the main analyses. Simple mediation analysis was tested by applying model 4 in process macro. Although our institution does not have a formal Ethics Committee, it is claimed that informed permission was obtained, and the authors followed all applicable ethical guidelines.

RESULTS

Correlation analysis shows that overall well-being significantly correlates with quality of life and coping self-efficacy. Among the demographics, age, and education correlate significantly with high coping self-efficacy and low negative emotions and loneliness levels. Income significantly correlates with overall well-being and coping self-efficacy (Table 1).

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Table 1: Pearson Correlation Between Study Variables (N = 150)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Age	-	0.84**	0.23**	0.004	-0.06	-0.15	-0.06	0.10	0.07	-0.31**	-0.15	-0.28**	-0.06	0.18*
2	Education	-	-	0.18*	0.07	0.01	-0.10	-0.03	0.19*	0.11	-0.31**	-0.08	-0.29**	-0.10	0.26**
3	Income	-	-	-	0.18*	0.10	0.14	0.09	0.15	0.14	-0.19*	0.12	-0.09	0.13	0.16*
4	Overall Well-being	-	-	-	-	0.82**	0.74**	0.74**	0.83**	0.60**	-0.15	0.73**	0.05	0.67**	0.71**
5	Positive Emotion	-	-	-	-	-	0.71**	0.71**	0.73**	0.18*	-0.11	0.68**	0.01	0.72**	0.64**
6	Engagement	-	-	-	-	-	-	0.60**	0.55**	0.19*	0.04	0.59**	0.10	0.55**	0.49**
7	Relationship	-	-	-	-	-	-	-	0.69**	0.07	-0.16*	0.65**	-0.09	0.69**	0.49**
8	Meaning	-	-	-	-	-	-	-	-	0.26**	-0.12	0.69**	-0.09	0.59**	0.69**
9	Accomplishment	-	-	-	-	-	-	-	-	-	-0.10	0.23**	0.19*	0.15	0.36**
10	Negative Emotion	-	-	-	-	-	-	-	-	-	-	-0.22**	0.52**	-0.28**	-0.21*
11	Health	-	-	-	-	-	-	-	-	-	-	-	-0.01	0.67**	0.66**
12	Loneliness	-	-	-	-	-	-	-	-	-	-	-	-	0.01	0.01
13	Quality of Life	-	-	-	-	-	-	-	-	-	-	-	-	-	0.64**
14	Coping Self-Efficacy	-	-	-	-	-	-	-	-	-	-	-	-	-	-

***: p <0.01, *: p < 0.05*

Gender differences were observed with coping self-efficacy, health, and negative emotions. Males scored significantly higher on coping self-efficacy ($M = 30.96$, $p < 0.05$) and health ($M = 22.75$, $p = 0.001$) in comparison to the female participants. Females scored higher on negative emotion ($M = 16.30$, $p = 0.001$) than their counterparts. Process macro by Hayes was utilized to carry out the main analysis. Simple mediation analysis was tested by applying model 4 in process macro. The results exhibited a significant direct and indirect effect of coping self-efficacy on well-being through quality of life. The analysis was controlled for gender, age, education, income, and family system, as the initial analysis showed differences across these demographics on study variables. After controlling for the effects of these variables, model 1 shows that coping self-efficacy has a positive effect (B = 3.98, p < 0.01) on well-being. The meditational model showed a significantly positive direct effect (B = 0.278, p > 0.01) as well as the indirect effect of coping self-efficacy on well-being (B = 1.20, 95% *CI* = 0.46, to 1.90). The bold-faced lines in figure 1 show the significant direct and indirect paths. These results show that having higher coping self-efficacy will have an accelerating effect on well-being. Similarly, coping self-efficacy also increases the quality of life and well-being (Table 2).

Table 2: Mediating effect of quality of life for the relationship between coping self-efficacy and well-being (N = 150)

Predictors	Well-being			
	Model 1	Model 2		
	B	*B*	95% CI	
			LL	UL
Constant	4.95	-30.69	-61.78	0.39
Gender	5.30	4.82	-0.88	10.52
Age	-1.05	-1.27*	-2.33	-0.20
Education	0.53	1.77	-0.34	3.87
Income	0.00002	0.00002	-0.00001	0.00004
Family System	-8.95**	-6.37*	-11.76	-0.98
Coping Self-Efficacy	3.98**	2.78**	1.97	3.58
Quality of Life	-	0.59**	0.31	0.87
R^2	0.58	0.63	-	-
ΔR^2	-	0.05	-	-
F	33.20**	34.10**	-	-

**p < 0.05, ** p < 0.01*

The meditational model confirmed the positive meditational role of quality of life in increasing the effect of coping self-efficacy on well-being. The model explained a 5% variance in outcome variable well-being (Figure 1).

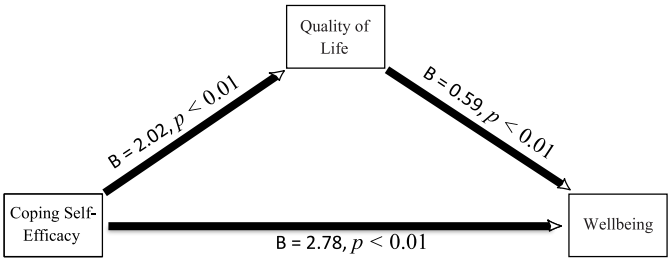

Figure 1: Mediating Effect of Coping Self-Efficacy on Well-being through Quality of Life

DISCUSSION

Self-efficacy and quality of life are closely linked with an individual's well-being. A number of studies examined the interplay among these variables [15, 16]. These studies found that quality of life is largely affected by self-efficacy and it adds to their well-being. The results of previous studies were largely supported by socio-cognitive theory [17]. The nexus between self-efficacy, well-being and quality of life is of quite significance in order to enhance overall well-being and prevent negative states of being. In this context, the PERMA model in positive psychology bears global significance for fostering flourishing on a

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broader scale. The current study was also undertaken to examine this nexus between self-efficacy, well-being and quality of life. One of the objectives of the current study was to explore the relationship between demographic and study variables. Initial analysis indicated that age and education significantly correlate with coping self-efficacy, negative emotions, and loneliness. Moreover, income significantly correlates with overall well-being and coping self-efficacy. These findings align with previous studies that showed similar results [18, 19]. These findings, in support with past researches, underscore the substantial role of different demographic groups in enhancing self-efficacy and aspects of wellbeing. Gender differences were also observed on coping self-efficacy, health, and negative emotions. Findings illustrated that males reported higher coping self-efficacy in comparison to female participants. In contrast, previous studies show that, in general, males report the poorest self-efficacy compared to females [9]. Nevertheless, these findings are supported by an indigenous study in Pakistan that also reported higher coping self-efficacy in men. Saeed explained this disparity through cultural differences [11]. It was stated that male dominance is observed in Pakistani culture, which can be related to elevated self-efficacy among men as compared to their female counterparts. In the present study, males also reported higher health scores than female participants, who in contrast scored higher on negative emotion. The results are supported by literature, e.g., one study on diabetics in Pakistan, showed similar results where men exhibited higher physical health than females whereas females showed higher diabetes-related distress and emotional problems [11]. These gender differences accentuate the substantial role of cultural effect in Pakistan that account for the differences found specifically in this cultural group when compared with studies done in other cultures. In simple terms, we can say that male dominancy in society can be attributed to facilitating one gender (male) in comparison to another (female). The second main objective of the study was to test our supposition of the direct and indirect effect of coping self-efficacy on well-being through quality of life. Based on the relationship between coping self-efficacy, quality of life, and well-being, it was hypothesized that coping self-efficacy will directly affect overall well-being. It was further hypothesized that the quality of life would mediate the effect of coping self-efficacy on well-being. Following these suppositions, the mediation analysis utilized process *Marco* by *Hayes* in 2013. The analysis was controlled for the effect of gender, age, income, education, and family system. Initial analysis of correlation and mean differences has shown that these variables significantly influenced the study variables in one way or another, so their effect was controlled in the advanced analysis to obtain precise results. The results confirmed our hypotheses. Results showed that increased coping self-efficacy was significantly directly associated with elevated well-being. These findings align with the previous research that described the direct positive relationship between coping self-efficacy with well-being and as a substantial predictor for improved well-being [5, 6]. Similarly, one study utilized mediation analysis and showed that a high level of self-efficacy improves the psychological well-being of individuals through their immune systems [10]. Other studies have also pointed at the facilitating role of self-efficacy in patients with myocardial infarction and diabetes mellitus [11, 20]. The improvement in well-being linked with increased self-efficacy may stem from these health outcomes reported by earlier researches. Likewise, the results from the present study also confirm the mediating effect of quality of life on the relationship between coping self-efficacy and well-being. It was established that, indirectly, after being mediated by the quality of life, the increase in coping self-efficacy was also significantly associated with a further increase in well-being. Researches from the past also support these results. One research found a strong predicting role of self-efficacy in increasing quality of life [13]. Another study indicated the relationship between quality of life with PERMA, where higher levels of quality of life were associated with greater well-being [4]. Similar results were reported in South Korea, where a strong relationship between quality of life was associated with better well-being using the PERMA measure [3]. A recent study on elderly population in Iran, explored the direct and indirect link between well-being and quality of life through self-efficacy. The study found that self-efficacy had direct association with quality of life and well-being. In addition, well-being directly and indirectly increases quality of life through self-efficacy [15]. The findings of the current study align with existing literature emphasizing the importance of quality of life and coping self-efficacy in promoting well-being. Consequently, intervention programs aimed at enhancing well-being could focus on targeting quality of life and coping self-efficacy to facilitate a more fulfilling life. It is suggested to improve well-being at a population level by enhancing the quality of life and self-efficacy to create more resilient and happy citizens for better-off societies. The present study contributes to the existing literature regarding the PERMA model of well-being. Literature also highlighted that such multi-component interventions in positive psychology have proven to be most effective among clinical and non-clinical populations for improving well-being [21]. Well-being is associated with several health and psychological benefits. Through this study,

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insights are gained into the factors that contribute to well-being, ultimately paving the way for a more fulfilling life. There are certain limitations of the present study, despite the significant findings. The sample was convenient, and the sample size was small due to the limited research time. The sample only included educated individuals, and most were from universities. Future research can address these limitations using a larger, more diverse sample.

CONCLUSIONS

We can summarize the findings by concluding that coping self-efficacy increases overall well-being. An individual's well-being increases further in the presence of a better quality of life. Moreover, demographic variables showed substantial role in affecting well-being and self-efficacy. Age and education positively correlated with coping self-efficacy and negatively correlated with loneliness and negative emotions. Overall well-being and coping self-efficacy were found greater among high income group. Gender comparison indicates that males have higher level of coping self-efficacy and health whereas; females have higher level of negative emotion.

Authors Contribution

Conceptualization: SS, SA
Methodology: SS
Formal analysis: SS
Writing-review and editing: SS, HM

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Examining the Predictive Relationship between Perceived Social Support and Perceived Stress among Pregnant Women

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ABSTRACT

The woman's mental and physical health will unavoidably suffer throughout her pregnancy. Extreme mood swings and, in rare occasions, mental instability can occur. These factors make pregnancy a time when a woman has to undertake bio-psycho-social modifications, such as establishing strong social support systems, in order to alleviate the stress that comes with being pregnant. **Objective:** To investigate the predictive relationship between perceived social support and perceived stress among pregnant women in Pakistan. **Methods:** The study used a correlational cross-sectional research design. The sample consisted of (N=72) pregnant females in their third trimester with an age range between 18 to 37 years (Mean age= 26.3; SD=4.4) was selected from departments of Obstetrics and Gynecology of various hospitals in Karachi, Pakistan by using purposive sampling technique. The data were collected from December 2022 till January 2023. The demographic information form, Multidimensional Scale of Perceived Social Support and Perceived Stress Scale were used, and analysis of data were done by using Regression analysis and One-way ANOVA through SPSS version 25.0. **Results:** The findings revealed a significant negative predictive relationship between perceived social support from friends and perceived stress of pregnant women (b= -.482, p<.05). The analysis of variance reveals that significant mean differences in socioeconomic status and number of miscarriages on perceived stress are present among pregnant women. **Conclusions:** These results emphasize the need to develop comprehensive strategies for assisting pregnant women by taking into account the aspects of social support, and make interventions to tackle stress successfully, and enhance maternal well-being throughout the pregnancy.

INTRODUCTION

Becoming pregnant is a very exciting and wonderful time for most of the women, and may also bring some physical and emotional challenges. According to existing literature, at this time of life, stress and sadness may be more common due to the hormonal changes that occur simultaneously [1]. It has also found that efforts to enhance maternal mental health during pregnancy have positive influence on the well-being of the mother and her children in the long-term [2]. In the third trimester of pregnancy, significant mental and physiological changes take place in anticipation of childbirth. Scientists have examined the prevalence of stress during pregnancy, and found that it differs over the three trimesters. One of the studies from China indicates that stress symptoms were more prevalent during the third trimester of pregnancy [3]. Studies also found out that social support functions as a buffer against the impact of stressful life experiences, and equips individuals with essential coping strategies to manage that stress effectively [4, 5]. Having perception of social support during challenging circumstances might potentially improve health by influencing how one perceive danger, that in turn reduce anxiety, and enhance ones capacity to cope. Perceived social support pertains to an individual's assessment of friends, family members, and others as accessible sources capable to offer assistance of various kinds (i.e., material, psychological, emotional, informational, and financial) in times of need. Consistent associations have been observed between perceived social support and well-being, as the perceived presence of support, affection, and caring tends to contribute to

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positive experiences [6]. Perceived stress pertains to the mental interpretations that an individual undergoes regarding the level of stress arising from a specific event or situation, whether at a particular moment or over an extended period of time [7]. Psychological stress in pregnancy is described as the state of disparity experienced by an expectant woman when she is unable to effectively manage the demands placed upon her, resulting in both behavioral and physiological manifestations [8]. Maternal stress during pregnancy fuels the likelihood of complications such as preterm delivery, premature birth, and cesarean section [9]. According to the prospective research, pregnant women who suffer from depression, anxiety, or stress are linked with an increased risk of emotional, cognitive and behavioral impairments in their unborn children [10]. The maternal stress experienced during pregnancy may promote the enhancement of anxiety and psychological health issues in their offspring later in life [11]. Social support networks aid pregnant women in maintaining good health and reducing the negative effects of environmental pressures [12]. Individuals are protected from the negative impacts of stressful events by social support, which is defined as the interaction between a person and their environment that decreases stress and covers their consequences [13]. Additionally, research has demonstrated that expectant mothers who perceived greater social support encountered fewer psychological issues and stressors [13]. Support from friends and family may have a positive impact on an expectant mother's mental health, anxiety levels, and stress levels before and after giving birth, according to previous research [14].

The literature on the perceived social support and perceived stress in the third trimester of pregnant women in developing countries specifically in Pakistan is scarce, that's why this research was necessary to see these factors together, for which following hypotheses were made.

1. A predictive relationship will exist between perceived levels of social support and the perceived stress of pregnant women.
2. A predictive relationship will exist between subscales of perceived social support and the perceived stress of pregnant women.
3. Demographics such as socioeconomic status and no of miscarriages will affect the study variables.

METHODS

The cross-sectional research design was used to determine the predictive relationship between perceived social support and perceived stress among pregnant women. The sample of the study includes 72 pregnant ladies in their third trimester of pregnancy with age range of 18 to 37 years ($\bar{x}$= 26.3; SD= 4.4). The study was conducted in maternal health departments of public and private hospitals in Karachi, Pakistan. Purposive sampling technique was used to get more variation in the sample characteristics. To maintain a balanced sample, females below 18 years and those above 37 years were excluded, as well as women who already have children. Moreover, individuals with pre-existing medical conditions like cardiac diseases, anemia, and diabetes were not part of the study to isolate the effects of pregnancy on healthy individuals. Additionally, women with diagnosed mental or psychiatric disorders or that on psychiatric medication was not the part of current study that allowed for a clearer examination of pregnancy's impact on mental well-being. By carefully selecting participants from this specific group, the research aims to shed light on the distinct experiences of first pregnancies within this age range. First of all, permission to collect data were taken from hospital authorities, and the participants were asked to sign a consent form, which was used to get their permission to participate in the research. The participant's freedom to withdraw from the research at any moment was discussed, and it was made clear that the data collected would be completely voluntary, will be kept confidential. The current study incorporated the use of the informed consent form, demographic form, and the Urdu versions of Perceived Stress Scale, and the Multidimensional scale of Perceived Social Support [15, 16]. The Perceived Stress Scale (PSS-10) is a 10-item questionnaire [15], used to evaluate stress levels in individuals aged 12 and older, including young children and adults. It assesses the extent to which a person has regarded life as unexpected, uncontrolled, and overwhelming in the last month. The scoring system uses a five-point scale, with a range from 0 (never) to 4 (very frequently). Items 4, 5, 7, and 8 are scored in the other direction. In order to calculate the overall scores, positive statements (4, 5, 7, and 8) are inverted, with a score of 4 representing "Never" and a score of 0 representing "Very often." The PSS total score runs from 0 to 40, with higher values indicating greater levels of perceived stress. The psychometric qualities of the Perceived Stress Scale-10 are deemed adequate, as shown by a Cranach's α value of .78, suggesting a high level of internal consistency. The Multidimensional Scale of Perceived Social Support (MSPSS) is a brief assessment measure [16]. This scale is especially created to examine people's subjective evaluations of the sufficiency of social support, with a specific emphasis on the assistance they get from family, friends, and significant others. The MSPSS consists of 12 questions and measures views of social support using a 7-point rating scale that ranges from "Very Strongly Disagree" (1) to "Very Strongly Agree" (7). The MSPSS yields a comprehensive score ranging from 12 to 84, where larger

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cumulative values indicate heightened levels of perceived social support. The study's variables were examined using SPSS version 25.0, a statistical tool for the social sciences. To evaluate the demographics of the whole sample, descriptive statistics were used. Linear regression analysis was applied to the study variables i.e., perceived social support and perceived stress as well as factors of perceived social support and perceived stress to make inferences about the data whereas, one-way ANOVA was used to analyze the differences in the scores on demographic variables such as socioeconomic status and no. of miscarriages, perceived social support and perceived stress.

RESULTS

Table 1 outlines demographic information of the research participants, screening that a significant portion of the cohort possessed a graduate degree (32 participants; 44.4%) and belonged to the lower middle class (33 participants; 45.8%). 58 participants (80.6%) had no history of abortion, while 12 (16.7%) participants reported having 1 abortion prior to current pregnancy. These demographic details offered a thorough insight into the characteristics of the individuals involved in the study.

Table 1: Demographic Properties of Sample

Baseline Characteristics	F (%)
Education	
Middle	2 (2.8)
Matric	7 (9.7)
Intermediate	14 (19.4)
Graduation	32 (44.4)
Masters	14 (19.4)
Post Masters	3 (4.2)
Socioeconomic Status	
Lower	4 (5.6)
Lower Middle	33 (45.8)
Middle	26 (36.1)
High	9 (12.5)
No. of Miscarriage	
No Miscarriage	58 (80.6)
1-time Miscarriage	12 (16.7)
More than 1	2 (2.8)
Age	
Mean±SD	26.32±4.44

As shown in table 2, results suggested that perceived social support (PSS) was not a statistically significant predictor of perceived stress.

Table 2: Coefficients of Regression with Perceived Social Support as a Predictor of Perceived Stress

Variables	Beta	SE	95% CI		B	p-value
			LL	UL		
Constant	17.525	5.161	7.232	27.819	-	0.001
PSS	-0.007	0.076	-0.159	0.146	-0.010	0.930

As shown in table 3, friends' support was found to be a significant predictor of perceived stress, family support and support from significant others did not show significant relationships with perceived stress in this analysis.

Table 3: Coefficients of Linear Regression of Factors of Perceived Social Support as Predictors of Perceived Stress

Variables	Beta	SE	95% CI		B	p-value
			LL	UL		
(Constant)	25.13	6.34	12.48	37.79	-	0.000
Family	-0.115	0.566	-1.24	1.014	-0.029	0.840
Friends	-0.482	0.234	-0.949	-0.016	-0.295	0.043
Sig others	0.147	0.279	-0.409	0.703	0.082	0.599

Dependent Variable: PS

The results indicated that there was no significant difference in perceived social support between the socioeconomic status groups. However, there was a significant difference in perceived stress, with higher levels of stress observed in the Poor and Lower Middle groups compared to the Middle and Upper Middle groups of pregnant women as shown in table 4.

Table 4: Mean Difference between the Scores of Socioeconomic Status, Perceived Social Support and Perceived Stress in Pregnant Women

Variables	Poor (n=4)	Lower Middle (n=33)	Middle (n=26)	Upper Middle (n=9)	F(3, 68)	η^2
	Mean±SD	Mean±SD	Mean±SD	Mean±SD		
PSS	62.0±10.58	63.8±15.98	66.73±14.66	73.33±8.57	1.128	.047
PS	28.75±26.17	15.21±6.87	17.12±8.10	17.08±9.35	2.799***	.110

Note. N= 72, PS= Perceived Stress; PSS=Perceived Social Support.

p>0.05***p<0.001

The results indicated that there was no significant difference in perceived social support based on the number of miscarriages. However, there was a significant difference in perceived stress, with higher levels of stress observed in the group with more than 1 miscarriage compared to the groups with no miscarriage and 1 miscarriage (table 5).

Table 5: Mean Difference in the scores of Number of Miscarriages, Perceived Social Support and Perceived Stress in Pregnant Women

Variables	No Miscarriage (n=58)	1 Miscarriage (n=12)	More than 1 (n=2)	F(3, 68)	η^2
	Mean±SD	Mean±SD	Mean±SD		
PSS	66.6±13.7	63.17±19.7	64.5±4.95	0.279	0.008
PS	16.72±7.67	14.92±4.01	40.5±38.89***	7.93	.187

Note. N= 72, PSS= Perceived Social Support; PS= Perceived Stress

p>0.05***p<0.001

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DISCUSSION

The current study reviewed the predictive association between PSS and PS and demographic differences in socio-economic status and no of miscarriages. Our results are indicative of no significant predictive relationship of perceived social support. In our results the study on antenatal depression and its predictors reported no significant association linking social support and antenatal stress and depression in pregnant women [8]. This result might also be attributed to the fact that expectant mothers can develop efficient coping methods, resilience, and high self-efficacy to lessen the effects of stress, regardless of the amount of social support a pregnant woman feels [17]. More reasons to support our result can be that living arrangements involving multiple members of a family are prevalent in Pakistan. Despite the positive effects on mental health, this may make it harder to isolate the role of social support in decreasing pregnancy-related stress. Moreover, religious activities and beliefs may help pregnant women in Pakistan deal with stress. Even when controlling for perceived levels of social support, factors such as faith-based support, beliefs about fate, and prayer may have substantial impacts on the perception and management of stress. Another predictive relationship will exist between subscales of perceived social support and the perceived stress of pregnant ladies. A current study reveals a significant predictive association between the subscale 'friends support' and perceived stress. Some studies are consistent with our results such as a study on expectant women in the last trimester resulted that having a strong support system from friends and family has a positive influence on a woman's psychological health and reduces stress levels [18]. Consistent with the above results is another study that revealed an inverse relationship between the presence of pregnancy stress and anxiety and the perception of availability of support from friends and family [19]. In the Pakistani context, the friends' support significantly affects perceived stress levels in pregnant ladies during the third trimester is grounded in social support theory, which emphasizes the role of interpersonal relationships in stress reduction [20]. Similarly, another research found that pregnant women's psychological well-being and stress reduced as the feeling of having the social support of friends and others [21]. Furthermore, this study found no significant predictive association between the sub-scales perceived family and significant others' support that may be attributed to the cultural norms as in Pakistani culture there is strong family and community networks that provide inherent social support to pregnant ladies. So, due to high perceived social support from family and significant others reduce the variation in perceived stress. Furthermore, Pakistani women may underestimate their own stress levels on self-report surveys because they put the health of their families and unborn children ahead of their own, they may feel pressure to appear strong and capable and underreport their stress levels. Furthermore, significant differences were seen in the demographic variables in terms of PSS and PS. The result showed that socioeconomic status had a significant negative relationship with perceived stress but an insignificant relationship with perceived social support. Previous research confirms that worse mental health outcomes are associated with poorer socioeconomic position during pregnancy [22, 23]. There is a heavy emotional and financial strain on expecting mums, and it may be difficult for low-income families to meet the demands of pregnancy, which include better health care, diet, and physical rest [24]. Pre-term births, psychological problems including stress and anxiety, a high prevalence of cesarean sections, and third-trimester hemorrhages are all associated with poor socioeconomic position, according to a large body of research [25]. Furthermore, a research study reports that lower socioeconomic status is correlated with high levels of stress and lower birth weights [23]. Literature indicated that low socioeconomic status is associated with daily stress and depressive symptoms in pregnant women [26]. Another research on prenatal depression in an urban population in Pakistan highlighted that rural areas characterized by higher levels of poverty, insufficient healthcare resources, and lower levels of education may be linked to increased amounts of antenatal stress, depression, and anxiety [22, 23].The findings of current research showed that there is a significant association of number of times one have miscarriages and perceived stress whereas an insignificant relationship was seen between no. of miscarriages and perceived social support. Previous research supports current results that having a history of miscarriage is significantly associated with stress, anxiety and depression [24]. Couples who suffer recurrent pregnancy loss exhibit more pronounced feelings of despair and stress, which last for a longer duration, and have a more significant detrimental effect on their mental well-being throughout future pregnancies, when compared to women who have only had one previous miscarriage [25].

CONCLUSIONS

Results showed that pregnant women had helpful social support, especially through friends. Our results are indicative of no significant predictive relationship between perceived social support as a whole and perceived family and significant other's support as its subscales. Moreover, the current study reveals a significant predictive association between the subscale 'friends support' and perceived stress among third-trimester pregnant women.

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This provides further evidence that friend's support is important for reducing stress during the latter stages of pregnancy. It is worth noting that there was no significant predictive association between perceived stress and either family or significant other support in this context. These shows how intricate the dynamics of social support are during pregnancy and how the support of friends may alter stress levels in a unique way. The findings emphasize the importance of reflecting different dimensions of social support separately and tailoring interventions to address specific sources of support that are most relevant for pregnant women. Strengthening friend support networks may be particularly beneficial in promoting maternal well-being and reducing stress during the third trimester of pregnancy.

Authors Contribution

Conceptualization: RM, AA
Methodology: RM, AA
Formal analysis: RM, AA
Writing, review and editing: RM, AA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Insights into Standard Precaution Knowledge and Adherence among Healthcare Workers: Evidence from Tertiary Care Hospitals in Peshawar, Pakistan

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ABSTRACT

Healthcare workers (HCWs) are at risk of being exposed to blood-borne infections when performing clinical activities, hence conventional measures must be followed. The study conducted in Peshawar was motivated by the inadequate adherence to standards in Pakistan. **Objective:** To evaluate tertiary care hospitals' healthcare workers' (HCWs) awareness of and adherence to standard precautions. **Methods:** Over the course of six months, 421 HCWs employed in a variety of public and commercial tertiary healthcare settings in Peshawar, Pakistan, participated in cross-sectional research. Convenient sampling was employed in the selection of participants. Three portions of a standardized questionnaire addressing adherence, knowledge, and demographics were administered. For data analysis SPSS version 27® was used, evaluating adherence and knowledge using scoring methods. **Results:** The majority of participants (78.1%) were new in their areas, and 68.2% had completed standard precautions training. Although the majority of healthcare workers (HCWs) showed high understanding (67.46%), there were still significant gaps in their knowledge, especially when it came to false beliefs about HIV and Hepatitis patient care. However, there was excellent adherence, particularly for trash disposal (73.6%) and hand hygiene (91.4%). When it came to knowledge and adherence, doctors outperformed lab technicians and nurses. **Conclusions:** Despite knowledge limitations, healthcare workers (HCWs) in Peshawar displayed outstanding adherence to basic procedures, going beyond theoretical comprehension. This underscores the importance of practical implementation in healthcare settings.

INTRODUCTION

As healthcare workers (HCWs) carry out their clinical duties in the hospital, they are exposed to pathogens such as Human immunodeficiency virus (HIV) and hepatitis viruses (Hep B & C) that can spread diseases [1, 2]. HCWs face a direct danger of exposure to blood and other bodily fluids, which can result from percutaneous injury, mucocutaneous injury or any other form of blood/body fluid contact with non-intact skin [3]. For these reasons to deliver medical care, a set of steps known as "standard precautions" is taken to prevent the spread of blood-borne pathogens by the Center of Disease Control (CDC) [4-6]. According to statistics, out of the 35 million HCWs in the world, two to three million of them contract Needle-stick or sharp injuries annually, which are responsible for up to 65% of all hepatitis B and C infections as well as 4.4% of HIV infections, with developing countries recording the highest rate of needle-stick injuries [4, 7]. Although healthcare professionals may not get infected, they could spread infections to other patients, including those who may be immunocompromised or have open injuries and to other

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healthcare workers [8]. Measures like hand sanitization, use of gloves, gowns, caps, and masks, caution when handling devices, clothing, and equipment, environmental control (such as surface processing protocols, hospital waste management) and appropriate disposal of sharp objects, such as needles are all examples of standard precautions [9, 10]. Studies throughout the world shows inadequate compliance by HCWs to standard precautions, which has been noted to be significantly impacted by a number of factors, including lack of knowledge and comprehension, lack of time to implement the precautions due to work overload, limited supplies, inadequate training, uneasy equipment, skin irritancy, forgetfulness, distance from the necessary amenities, and a lack of management support in developing a facilitating work environment [11]. It can be seen around the literature that despite the creation of comprehensive guidelines for infection management, standard precautions are poorly understood and improperly used in underdeveloped nations [12]. In Pakistan, despite the existence of comprehensive guidelines, the implementation of infection control measures in hospital settings remains inadequate, with standard precautions not being adhered to as necessary [13].

Therefore, this study was designed to assess healthcare workers' knowledge and adherence to standard precautions in various public and private tertiary care hospitals in Peshawar, Pakistan.

METHODS

The study was designed as a cross-sectional study with a duration of six months, spanning from June to the end of November 2023. Data collection was conducted among healthcare professionals working in diverse public and private healthcare settings located in Peshawar, Khyber Pakhtunkhwa (KPK). Utilising a default value, a 95% confidence level (CI), a 5% confidence interval (d), and an expected frequency (p) of 50%, the sample size calculation was based on a population (N) of 1,000,000. Using the Open Epi sample size calculator, this computation yielded a sample size of 384. The sample size was extended to 400 participants to account for probable attrition and dropout, and every participant completed their replies within the study's designated timeframe. The authors performed a pilot study with 21 healthcare workers who were chosen by convenience sampling before starting the main investigation. Finding any difficulties or problems with data collecting was the aim, along with assessing the appropriateness of the questionnaire items. The appropriateness and clarity of the questionnaire's language and substance were validated by participant feedback. The tasks were seen as straightforward to perform, relevant, thorough, and clear. The responses from the pilot study, totalling 21, were integrated into the analysis, thereby augmenting the total sample size to 421. Participants were selected using a convenient sampling technique, resulting in a total of 296 doctors, 112 nurses, and 13 lab technicians as sample participants. Inclusion criteria encompassed individuals of all genders who were active healthcare professionals (including doctors, nurses, and lab technicians) practicing within public and private healthcare institutions located in Peshawar, Khyber Pakhtunkhwa. Participants were required to demonstrate a voluntary willingness to partake and provide informed consent. Exclusion criteria comprised individuals who refused to participate or submitted incomplete questionnaire responses, as well as those on extended leave or sabbatical during the study period. The Institutional Review Board (IRB) and Ethics Committee (EC) of the Northwest School of Medicine approved the study design (IRB&EC/2023-SM/068) (Issuance date: 20th March, 2023). Prior to commencing interviews, all study subjects were fully informed, and consent was obtained. The confidentiality of the information provided was assured. The study utilized a pre-tested and structured questionnaire, with a Cronbach's alpha value exceeding 0.9, to gather data. Administered to participants, the questionnaire consisted of three sections. The first part centered at5 demographic details, followed by a section targeting participants' knowledge. The final segment focused on probing participants' adherence to standard precautions. Data analysis was conducted using SPSS version 27.0®. Categorical data were presented as frequencies (n) and percentages (%), while mean values were calculated where applicable. The study employed the chi-square test to investigate the correlation between the responses provided by healthcare professionals. A significance level of 0.05 was set to identify any notable differences. The participants' overall knowledge of standard precautions was evaluated by assigning zero points for incorrect answers and two points for correct answers across eight questions, with a maximum possible score of 16. Participants scoring between 0 and 5 points were categorized as having limited knowledge, while those scoring from 6 to 10 were considered to possess a moderate level of knowledge. Those who scored between 11 and 16 points were classified as having a high level of knowledge. Similarly, adherence to standard precautions was assessed using a scoring system. Participants who never practiced received 0 points, sometimes practitioners received 1 point, and consistent practitioners were awarded 2 points across eight questions, with a maximum potential score of 16. Participants scoring between 0 and 5 points were labelled as having poor adherence to standard precautions, while those scoring

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between 6 and 10 demonstrated moderate adherence. Individuals scoring between 11 and 16 exhibited strong adherence to these precautions.

RESULTS

The study included participants with age ranging from 17 years to 45 years with a mean age of 26.87 ± 4.030. Out of the total number of 421 participants, 296 were doctors, 112 were nurses and 13 were lab technicians. In the study conducted, 47.5% (200/421) were males with majority working in public section (60%) and 52.5% were females, out of which 71% belonged to private sector (Table 1).

Table 1: Gender Distribution in Healthcare Professions

Category	Male (%)	Female (%)	Total (%)
Doctor	165 (55.7)	131 (44.3)	296 (100)
Nurse	28 (25)	84 (75)	112 (100)
Lab Technician	7 (53.8)	6 (46.2)	13 (100)
Total	200 (47.5)	221 (52.5)	421 (100)

A total of 34.2% of the participants worked in public section, and 65.8% of the participants were from private sector (Table 2).

Table 2: Sector-Wise Distribution of Healthcare Professions

Category	Public Sector (%)	Private Sector (%)	Total (%)
Doctor	113 (38.2)	183 (61.8)	296 (100)
Nurse	26 (23.2)	86 (76.8)	112 (100)
Lab Technician	5 (38.5)	8 (61.5)	13 (100)
Total	144 (34.2)	277 (65.8)	421 (100)

It was observed in the study that 78.1% of the participants were new to their respective fields, namely 233/296 doctors, 89/112 Nurses and 7/13 Lab Technicians (Table 3).

Table 3: Work Experience in Healthcare Fields

Category	Less than 5 Years (%)	More than 5 Years (%)	Total (%)
Doctor	233 (78.7)	63 (21.3)	296 (100)
Nurse	89 (79.5)	23 (20.5)	112 (100)
Lab Technician	7 (53.8)	6 (46.2)	13 (100)
Total	329 (78.1)	92 (21.9)	421 (100)

It was also inquired that a greater number of the participants had previously undergone standard precautions training sessions (68.2%), out of which 72.5% were young participants having a work experience of less than 5 years (Table 4).

Table 4: Standard Precautions Training Status among Healthcare Workers

Category	Yes (%)	No (%)	Total (%)
Doctor	192 (64.9)	104 (35.1)	296 (100)
Nurse	85 (75.9)	27 (24.1)	112 (100)
Lab Technician	10 (76.9)	3 (23.1)	13 (100)
Total	287 (68.2)	134 (31.8)	421 (100)

It was observed that 43.9% of the participants thought the standard precautions were applied to HIV and Hepatitis patients only. (p-Value = 0.046) and 46% (194/421) were of the view that used needles can be replaced after giving injections. 148/421 participants did not consider saliva to be infected, so in their view standard precautions were not necessary when in contact with saliva. Majority of the healthcare workers (87.8%) had an idea about cleaning blood spills with sodium hypochlorite (p-Value = 0.000) Regardless of the above mentioned points, a large number of participants had a good idea of standard precautions to be applied to all patients regardless of their infectious state, gloves to be worn to the procedure of HIV patients and standard precautions to be applied to situations that might lead to contact with tears, urine or feces, the mentioned points had a significance of 0.028, 0.020 and 0.000 respectively (Table 5).

Table 5: Knowledge about Standard Precautions among Healthcare Professionals

Variable	Doctor (%)	Nurse (%)	Lab Tech (%)	Total (%)	p-Value	x^2-Value
Standard Precautions are Applied to Patients with HIV and Hepatitis Only.						
True	135 (73)	41 (22.2)	9 (4.9)	185 (100)	0.046	6.155
False	161 (68.2)	71 (30.1)	4 (1.7)	236 (100)		
Used Needles can be Reused after Giving Injections.						
True	131 (67.5)	55 (28.4)	8 (4.1)	194 (100)	0.357	2.059
False	165 (72.7)	57 (25.1)	5 (2.2)	227 (100)		
Standard Precautions are not Necessary in Conditions that Might Lead to Contact with Saliva.						
True	97 (65.5)	48 (32.4)	3 (2)	148 (100)	0.106	4.485
False	199 (72.9)	64 (23.4)	10 (3.7)	273 (100)		
Healthcare Workers with Non-Intact Skin Should not be Involved in Direct Patient Cares until Condition Resolves.						
True	223 (72.4)	75 (24.4)	10 (3.2)	308 (100)	0.223	2.998
False	73 (64.4)	37 (32.7)	3 (2.7)	113 (100)		
Blood Spills should be Cleaned Up Promptly with Sodium Hypochlorite.						
True	273 (73.8)	84 (22.7)	13 (3.5)	370 (100)	0.000	42.506
False	23 (45.1)	28 (54.9)	0 (0)	51 (100)		
Standard Precautions should be Applied to All Persons Regardless of their Infectious Status.						
True	278 (71.6)	97 (25)	13 (3.4)	388 (100)	0.000	42.506
False	18 (54.5)	15 (45.5)	0 (0)	33 (100)		
Gloves are Necessary in all Caring Procedures for HIV Patients.						
True	259 (72.5)	86 (21.4)	12 (3.4)	357 (100)	0.020	7.823
False	37 (57.8)	26 (40.6)	1 (1.6)	64 (100)		
Standard Precautions should Apply to Situations that Might Lead to Contact with Tears/Urine/Feces.						
True	290 (72.5)	97 (24.3)	13 (3.3)	400 (100)	0.000	22.852
False	6 (28.6)	15 (71.4)	0 (0)	21 (100)		

Figure 1 shows that 67.46% of the participants had good knowledge of standard precaution, and the rest 31.59% and 0.95% had moderate and poor knowledge respectively

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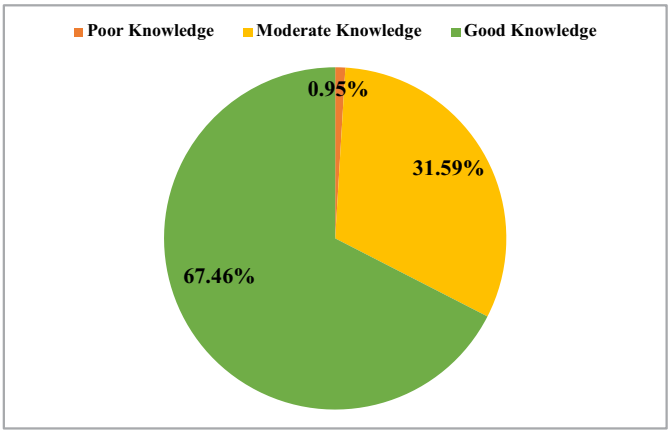

Figure 1: Total Knowledge of the Healthcare Workers about Standard Precautions

When inquired about hand hygiene practices, 91.4% of respondents consistently stated that they "always" adhere to hand hygiene protocols, whereas a mere 0.95% admitted to "never" practicing hand hygiene. (p-Value = 0.054). Approximately 80.2% of respondents affirmed that they consistently follow the practice of wearing gloves, (p-Value =0.009) while 74.1% confirmed their unwavering adherence to wearing masks. (p-Value = 0.008). The utilization of aprons and goggles showed a less prominent trend compared to gloves and masks. Out of 421 participants, 163 (approximately 38.7%) always used aprons, while 182 (about 43.2%) always used goggles. In contrast, 84 participants (around 19.9%) never used aprons, and 86 participants (roughly 20.4%) never used goggles. A similar trend was followed about avoiding needle recapping as standard precaution. A significant majority of participants, approximately 73.6%, consistently adhered to the waste disposal coding system, while an even higher percentage, around 78.6%, consistently practiced covering broken skin as part of standard precautions (Table 6).

Table 6: Healthcare Professionals Adherence to Standard Precautions

Variable	Doctor (%)	Nurse (%)	Lab Tech (%)	Total (%)	p-Value	x^2-Value
Do You Perform Hand Hygiene as Standard Precaution?						
Always	276 (71.7)	96 (24.9)	13 (3.4)	385 (100)	0.054	9.321
Sometimes	19 (59.4)	13 (40.6)	0 (0)	32 (100)		
Never	1 (25)	3 (75)	0 (0)	4 (100)		
Do You Use Gloves as Standard Precautions?						
Always	245 (72.5)	82 (24.3)	11 (3.3)	338 (100)	0.009	13.624
Sometimes	51 (64.6)	26 (32.9)	2 (2.5)	79 (100)		
Never	0 (0)	4 (100)	0 (0)	4 (100)		
Do You Use Mask as Standard Precaution?						
Always	221 (70.8)	79 (25.3)	12 (3.8)	312 (100)	0.008	13.804
Sometimes	72 (73.5)	26 (26.5)	0 (0)	98 (100)		
Never	3 (27.3)	7 (63.6)	1 (9.1)	11 (100)		
Do You Wear Apron as Standard Precaution?						
Always	111 (68.1)	45 (27.6)	7 (4.3)	163 (100)	0.707	2.154
Sometimes	125 (71.8)	44 (25.3)	5 (2.9)	174 (100)		
Never	60 (71.4)	23 (27.4)	1 (1.2)	84 (100)		
Do You Use Goggles for Protecting Eyes as Standard Precaution?						
Always	117 (64.3)	59 (32.4)	6 (3.3)	182 (100)	0.141	6.909
Sometimes	111 (72.5)	37 (24.2)	5 (3.3)	153 (100)		
Never	68 (79.1)	16 (18.6)	2 (2.3)	86 (100)		
Do You Avoid Needle Recapping as Standard Precautions?						
Always	182 (71.9)	64 (25.3)	7 (2.8)	253 (100)	0.864	1.284
Sometimes	63 (70)	24 (26.7)	3 (3.3)	90 (100)		
Never	51 (65.4)	24 (30.8)	3 (3.8)	78 (100)		
Do You Follow Color Coding for Waste Disposal as a Standard Precaution?						
Always	212 (68.4)	88 (28.4)	10 (3.2)	310 (100)	0.235	5.552
Sometimes	70 (78.7)	16 (18)	3 (3.4)	89 (100)		
Never	14 (63.6)	8 (36.4)	0 (0)	22 (100)		
Do You Cover Broken Skin as Standard Precaution?						
Always	239 (72.2)	83 (25.1)	9 (2.7)	331 (100)	0.502	3.346
Sometimes	45 (65.2)	21 (30.4)	3 (4.3)	69 (100)		
Never	12 (57.1)	8 (38.1)	1 (4.8)	21 (100)		

Figure 2 illustrates that a substantial majority of participants, specifically 81.00%, demonstrated commendable adherence to standard precautions. Meanwhile, 18.52% exhibited a moderate level of practice, and a mere 0.48% displayed inadequate practice in this regard.

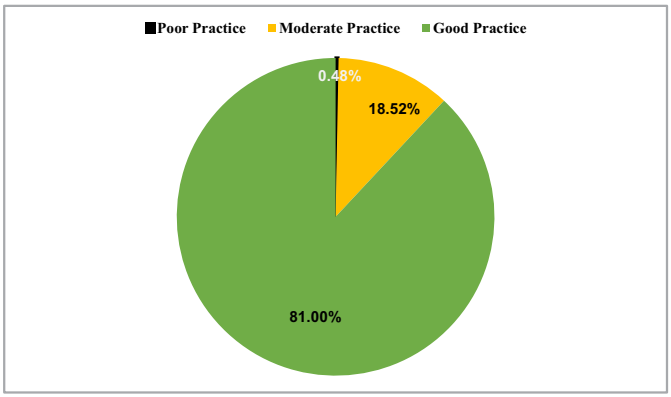

Figure 2: Adherence to Standard Precautions by Healthcare Professions

DISCUSSION

Standard Precautions encompass the necessary work practices essential for achieving the highest level of infection control in the treatment of all clients, irrespective of their diagnosis. These precautions encompass a comprehensive set of policies, procedures, and activities designed to prevent or minimize the potential transmission of infectious diseases within healthcare institutions [14]. A comprehensive literature review has underscored the

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insufficient awareness and adherence to standard precautions in our region. This identified gap in knowledge and practices has prompted our research study, which aims to investigate the understanding and implementation of standard precautions among healthcare professionals. In a study conducted in Ethiopia [15], findings revealed a positive attitude towards infection prevention practices, with 83.3% of participants demonstrating a good attitude. However, concerning safety incidents, the study reported a lifetime prevalence of needle-stick injuries at 40% and exposure to body fluids at 39.8%. In our own study, we observed that 46% of participants held the belief that needles could be reused, with notable variations among healthcare professionals, including 67.5% of doctors, 28.4% of nurses, and 4.1% of lab technicians endorsing this misconception. In another study in Palembang, it was noticed that 56.7% had good compliance of the standard precautions and nurses of the operating room and emergency room adhered more to standard precautions as compared to ward nurses [16]. Additionally, a notable 35.1% of participants in our study thought that standard precautions were unnecessary when in contact with saliva. Despite these concerning attitudes and beliefs, it is noteworthy that our study found an overall adherence rate of 81% to standard precautions among participants. Alshammari *et al.*,'s study revealed that nursing students displayed moderate compliance with standard precautions, with the most adherence observed in students covering their mouth and nose while wearing a mask [17]. In contrast, our participants exhibited the highest compliance in hand hygiene (91.4%), followed by wearing gloves (80.2%), and covering broken skin (78.6%). A study conducted in Jordan, consistent with our own research, indicated that 95.1% of participants were familiar with standard precautions, and 94% recognized the universality of these precautions [18]. While the majority of participants demonstrated overall compliance, 75.6% exhibited strong adherence specifically to the use of goggles. Our study similarly revealed lower compliance rates for aprons (38.7%) and goggles (43.2%), with 43.9% of participants expressing the belief that standard precautions only apply to patients with HIV and Hepatitis B. In a study conducted in Karachi, Pakistan, it was discovered that 69.3% of the participants exhibited good knowledge of standard precautions [19]. Similarly, our own study revealed that 67.46% of participants were knowledgeable on this subject. These findings suggest that approximately one-third of the participants still lacked a sufficient understanding of standard precautions. This trend was also observed in another study from Pakistan, indicating the necessity for enhancement in the understanding of standard precautions within the nursing community. The findings underscored the need for improvement not only in the knowledge of nurses but also in the implementation of standard precautions among both nurses and doctors [20]. Despite the limitations, the robust sample size, rigorous questionnaire validation through pilot testing, and the use of a structured questionnaire with a high Cronbach's alpha value, ensuring internal consistency reliability, the inclusion of diverse healthcare professionals and the comprehensive assessment of knowledge and practices regarding standard precautions enhance the overall validity of the study's findings.

CONCLUSIONS

The study's main finding was that doctors had a better understanding of standard precautions and a stronger commitment to following them than nurses and lab technicians. Nevertheless, an interesting finding indicated that a moderate number of participants had theoretical knowledge of standard precautions. However, many participants, including physicians, nurses, and lab technicians, actively implemented, and adhered to these safety measures in their daily work routine.

Authors Contribution

Conceptualization: SZ, KK, NS, SM
Methodology: SZ, KK, NS, MMA, AK, JK
Formal analysis: SZ, KK, SJ, MMA, AK, JK, SM
Writing-review and editing: SZ, KK, SJ, SM, JS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Assessment of Tongue Scraper and Using Baking Soda Mouth Wash in Reduction of Halitosis

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ABSTRACT

Bad breath, also known as halitosis, is a symptom in which a noticeably unpleasant breath odor is present. It can result in anxiety among those affected. It is also associated with depression and symptoms of obsessive compulsive disorder. **Objective:** To compare the effectiveness of tongue scraper and sodium bicarbonate (baking soda) mouthwash in reduction of halitosis. **Methods:** This comparative cross-sectional study was organized in undergraduate students of Paramedics Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro. Individuals aged 18 to 30 years of age were included by non-probability convenient sampling technique. Data were analysed by SPSS Version-26.0. **Results:** A total of 302 cases were comparatively studied. Males were in preponderance in both groups. Before treatment, 2.6% had slight odor, 33.8% had moderate odor, 28.5% had heavy odor, 23.85% had strong odor and 11.2% had intense odor in Group A, while 14.6% had slight odor, 19.9% had moderate odor, 25.8% had heavy odor, 21.8% had strong odor and 17.8% had intense odor in Group B (p=0.04). After treatment baking soda mouthwash showed more efficacious in terms of decrease the halitosis and its severity. In 21.2% halitosis was completely reduced and remaining most of the cases had mild and moderate halitosis compared to tongue scraper technique, while strong odor was completely reduced in both groups (p-0.001). **Conclusions:** Sodium bicarbonate (baking soda) mouthwash was observed to be the more effective in terms of decrease the halitosis and its severity compared to the tongue scraper technique among individuals presented with halitosis.

INTRODUCTION

Countless and different types of odors with complex substances are present in the human breath, these odors can create unpleasing conditions called Halitosis [1]. The general term used for the disagreeable odor is "Halitosis". It emerges from intraoral and extra oral sources. "Oral Malodor" precisely directs to the malodor emerging from the oral cavity [2]. A state of a person that suffers from bad breath is a condition which influences huge population. Bad breath emerging from the mouth is because of presence of Volatile Sulfide Compounds (VSCs) which are produced by metabolism of bacteria [3-5]. The prime source of halitosis is the dorso-posterior area of the tongue. To be specific the tongue-coating consists of proteolytic bacteria that degenerates protein which in turn causes the building up of cysteine and methionine which are additionally converted into hydrogen sulfide and methyl mercaptan by certain species of bacteria [6-8]. The primary treatment of halitosis is scrapping of the tongue coating with the help of scrappers. Throughout the world different studies have been documented with high prevalence rates of halitosis among young, adult and elderly populations [9, 10]. Worldwide population has 20% to more than 50% of halitosis prevalence rate. Oral malodor causes important issues of social and mental

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complications in relationships also [11, 12]. Experimental proof strongly proposes that around 80%–90% of unpleasant odors are caused by Volatile Sulphur Compounds (VSCs) caused by the degradation of organic elements by anaerobic bacteria which are present in the oral cavity. These anaerobic bacteria are also related in causing gingivitis/periodontitis and are usually present in the coating situated on the dorso-posterior surface of the tongue [13-16]. Halitosis is major cause of discomfort in individual's life and affects their day to day activity and social interactions; different methods and techniques have been conducted in researches regarding reduction of halitosis.

The rationale of this study is to observe the diminution of halitosis by introducing tongue scrapping method and sodium bicarbonate mouthwash in two groups.

METHODS

Comparative cross-sectional study was undertaken in graduating candidates of Paramedics Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro in length of six months duration by non probability convenient sampling approach. Ethical approval from the Institutional Ethical Review Committee of LUMHS Jamshoro was granted (Ref No: LUMHS/REC/-08) on dated (04/01/2021). Patients of either gender aged 18 to 30 years were included and patients with systemic diseases causing halitosis was excluded by taking brief history of the subjects, habit of smoking and betel nuts, pregnant women, periodontal diseases, no severe dental caries, subjects wearing orthodontic appliances, no current use of antibiotics and subjects with no history of antibiotics use for at least 3 weeks were excluded from the study. Sample size was calculated by sample calculation equation using the margin of error 5%, at confidence interval 95%, with 75% prevalence of halitosis [10]. Keeping all values together: n = z2 p x q/ e2 Taking 5% more subjects as non-responders, we get total sample size as: n= 302 (3-9%) of sodium bicarbonate product having a pH value of about 8.0 to 9.3 is used to make a stable mouthwash. Groups consisting of Blue #1, Red #4, Red#19 and Red #33 along with dye selection is done from 0.005% to 0.002%.With inclusion of 5% to 15% of ethanol or isopropanol. Herbal medicinal or mint flavor oil is used 0.05% to 0.4%. Member of group containing nonionic and anionic emulsifier is used to give flavor oil in concentration of 0.01% to 4.0% and balanced deionized water. The product is being composed by dissolving the sodium bicarbonate in deionized water, then by amalgamating the resulting solution with the existing constituents of ethanol or isopropanol. Filtration of sodium bicarbonate solution from 0.1-1.0 micron and it is filtered for about 12 hours soon after the process by which the resultant product had concentration of bacteria less than 10counts/mol [3]. After approval of from institutional Ethical Review Committee, the data were collected from the undergraduate paramedic students of LUMHS Jamshoro and it was obtained via the subjects' informed permission. The study subjects underwent a clinical examination and were divided into two: Group A and B randomly with 151 participants in each group respectively. In group at each participant was provided with tongue scrapper. In Group B each participant was provided with baking soda herbal mouthwash. Instructions and usage of how to use mouthwash and tongue scrapper were advised and explained to them in detail. Breath Alert was used to check the participant's level of halitosis before introduction of the respective methods and the values were noted and were checked after implementation of these methods in a time period of 3 months and values were noted and comparison was done between the two groups to see which group is more effective. Participants were restricted from consuming of strong odor foods, like onions, eggs, garlics, gingers, cabbages. The Breath Alert is specially designed instrument which is used for the detection of halitosis and it works by measuring hydrogen sulfide and methyl mercaptans commonly known as Volatile Sulfur Compounds (VSCs). Data were analysed by SPSS Version-26.0. Variables such as age were compared in mean and standard deviation. Other variables like gender, treatment group, malodor, use of mouthwash, treatment taken were computed as frequency and percentages. The independent t-test was applied between treatment groups to check the statistical significance.

RESULTS

A total of 302 cases were comparatively studied, in terms of treatment of the halitosis. Average age of the patients of Group A was 23.01 ± 1.69 years and average of Group B was 24.07 ± 5.95 years, findings of the average were statistically non-significant (p = 0.06).

Table 1 shows males were in majority in both groups as 66.2% in Group A and 57.6% were in Group B (p = 0.088). Before treatment odor severity was statistically insignificant in both groups (p = 0.04). After treatment baking soda mouthwash showed more efficacious in terms of decrease, the halitosis and its severity. In 21.2% halitosis was completely reduced and remaining most of the cases had mild and moderate halitosis compared to tongue scraper technique, while intense odor was completely reduced in both groups (p=0.01). After treatment the average score of halitosis was decreased in both groups, while it was more decreased in baking soda mouthwash group compared to the tongue scraper technique group (p = 0.001).

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Table 1: Average Age and Gender Wise Comparison in Groups

Variable	Group A (n=151)	Group B (n=151)	p-value
Age			
Mean ± SD	23.019 ± 1.698	24.072 ± 5.955	0.06
Gender			
Male	100 (66.2%)	87 (57.6%)	0.088
Female	51 (33.8%)	64 (42.4%)	

In the table 2, the participants were feeling bad breath as 13.9% in Group A and 9.3% in Group B during morning, 11.3% in Group A and 6.6% in Group B during hunger and 63.6% cases of Group A and 73.5% cases of Group B were feeling bad breath after walking up, while remaining few cases of both groups were feeling it all day and when thirsty (p = 0.02). Table 2 is showing that, out of all 25.8% cases of Group A and 23.8% cases of Group B used mouth wash (p = 0.68).

Table 2: Frequency of Mouthwash and Malodor in Groups

Variables		Group A N (%)	Group B N (%)	Total N (%)	p-value
Do you use mouthwash?	Yes	39 (25.8%)	36 (23.8%)	75 (24.8%)	0.68
	No	112 (74.2%)	115 (76.2%)	227 (75.2%)	
When do you feel Oral malodor mostly?	All day	2 (1.3%)	2 (1.3%)	4 (1.3%)	0.02
	Morning	21 (13.9%)	14 (9.3%)	35 (11.6%)	
	While talking to other people	3 (2.0%)	4 (2.6%)	7 (2.3%)	
	When thirsty	12 (7.9%)	4 (2.6%)	16 (5.3%)	
	When hungry	17 (11.3%)	10 (6.6%)	27 (8.9%)	
	Just after waking up	96 (63.6%)	111 (73.5%)	207 (68.5%)	
	Never	0 (0.0%)	6 (4.0%)	6 (2.0%)	

According to the severity of the halitosis before treatment, 2.6% had slight odor, 33.8% had moderate odor, 28.5% had heavy odor, 23.85 had strong odor and 11.2% had intense odor in Group A, while 14.6% had slight odor, 19.9% had moderate odor, 25.8% had heavy odor, 21.8% had strong odor and 17.8% had intense odor in Group B (p = 0.04). After treatment baking soda mouthwash showed more efficacious in terms of decrease the halitosis and its severity. In 21.2% halitosis was completely reduced and remaining most of the cases had mild and moderate halitosis compared to tongue scraper technique, while intense odor was completely reduced in both groups (p = 0.001).

Table 3: Pre-Treatment and Post-Treatment Severity of Halitosis in Groups

Variables		Study Groups		Total N (%)	p-value
		Group A N (%)	Group B N (%)		
Before Treatment	Slight Odor	4 (2.6%)	22 (14.6%)	26 (8.6%)	0.04
	Moderate Odor	51 (33.8%)	30 (19.9%)	81 (26.8%)	
	Heavy Odor	43 (28.5%)	39 (25.8%)	82 (27.2%)	
	Strong Odor	36 (23.8%)	33 (21.8%)	67 (22.9%)	
After Treatment	No Odor	5 (3.3%)	32 (21.2%)	37 (12.3%)	0.001
	Slight Odor	48 (31.8%)	72 (47.7%)	120 (39.7%)	
	Moderate Odor	60 (39.7%)	35 (23.2%)	95 (31.5%)	
	Heavy Odor	31 (20.5%)	10 (6.6%)	41 (13.6%)	
	Strong Odor	7 (4.6%)	2 (1.3%)	9 (3.0%)	

Before treatment halitosis average score 3.08 ± 1.09 in Group A and 3.05 ± 1.40 was in Group B, without significant difference (p = 0.85). After treatment the average score of halitosis was decreased in both groups, while it was more decreased in baking soda mouthwash group compared to the tongue scraper technique group (p = 0.001) as indicated in Table 4.

Table 4: Comparison of Pre-Treatment Halitosis Average Scores In Both Groups

Variable	N	Mean ± SD	p-value
Pre Treatment			
Group A	151	3.08 ± 1.09	0.06
Group B	151	3.05 ± 1.40	
Post Treatment			
Group A	151	1.91 ± 0.91	0.001
Group B	151	1.19 ± 0.89	

(t - Value 0.18)

DISCUSSION

Halitosis is the most prevalent reason for a patient to be sent to a dentist. It is a serious multifaceted health problem that negatively impacts a person's social and psychological well-being. If the aetiology can be accurately identified by a thorough clinical examination, it can be treated. The average age of the patients of Group A was 23.019 ± 1.69 years and average of Group B was 24.07 ± 5.95 years, and males were in majority in both groups 66.2% in Group A and 57.6% were in Group B. Consistently Choi et al., reported that the average age of the halitosis cases was 23.9 ± 5.4 years and males were in majority 37 while females 19 out of all [17]. In this study after treatment baking soda mouthwash showed more efficacy in terms of decreasing the halitosis and its severity. In 21.2% subjects halitosis was completely reduced while remaining subjects suffered from mild to moderate halitosis compared to tongue scraper technique; the intense malodor was completely reduced in both groups (p = 0.001). On other hand, the study of Wu *et al.*, reported that the instructions to quit smoking and use of baking soda dentifrices are recommended [18]. There is dearth of literature on such comparison. Tongue coating turned out to be the primary source of foul breath in a study on the effectiveness of tongue cleaning to prevent bad breath; as a result, tongue coating must be taken care of. The time span of an effect from a tongue scraper is less than that of a tongue brush since it is limited to removing the biofilm's top layer. Additionally, using a tongue scraper too vigorously might cause damage to the tongue. In another study by Kim *et al.*, reported that the sodium

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bicarbonate known as baking soda. Sodium bicarbonate has generally been used both inside and outside the country [19]. Because sodium bicarbonate is soft and has a low abrasively, it is thought to be less potentially damaging to enamel and dentin. In a clinical study it was demonstrated that the plaque controlling effect of dentifrice containing sodium bicarbonate was higher than the control dentifrice without sodium bicarbonate. Also, since sodium bicarbonate is a natural buffer, it helps maintain the mouth's natural pH level as it neutralizes food acids, even after brushing. Because of the well-known effects of sodium bicarbonate, dentifrice containing sodium bicarbonate is recommended by dentists to control oral malodor. In another study it is sated that the baking soda dentifrices have been shown to achieve a significant odor-reducing benefit for time periods up to 3 h [20]. The mechanisms by which baking soda inhibits oral malodor are related to its bactericidal effects.

CONCLUSIONS

Sodium bicarbonate (baking soda) mouthwash was observed to be the more effective in terms of decrease the halitosis and its severity compared to the tongue scraper technique among individuals presenting with halitosis. By using the sodium bicarbonate mouthwash the individuals can live in better quality of life after decreasing halitosis.

Authors Contribution

Conceptualization: PT
Methodology: SPR
Formal analysis: NT, KNM
Writing, review and editing: JU, RK, PT, SPR

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Perinatal Outcomes of High Risk Pregnancies: Experience of a Tertiary Care Hospital

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ABSTRACT

High Risk Pregnancy (HRP) denotes a condition where the mother, the fetus, or both are predisposed to complications during the gestation period, at birth, or postnatally, which is affected by several factors. **Objective:** To analyze the perinatal outcomes of high-risk pregnancies, focusing on the experience of a tertiary care hospital. **Methods:** A longitudinal study over two years, from October 1, 2020, to December 31, 2022, was conducted on 213 high-risk pregnant women, via purposive sampling, who attended the antenatal clinic Liaquat University Hospital, Hyderabad and Jamshoro. After obtaining informed written consent, interviews were conducted with the participants to collect data about their sociodemographic, obstetric, and gynecological histories. Perinatal outcomes were evaluated on the 8th day post-delivery, during which details concerning maternal and fetal complications in terms of morbidity and mortality, were documented. **Results:** Rh-negative pregnancy was found to be the most high-risk factor with 24.4% (52) of the cases, followed by teenage pregnancy at 12.2% (26), and short stature at 10.9% (23). Additionally, severe anemia was found in 21 women (9.8%), Pregnancy Induced Hypertension (PIH) in 18 women (8.6%), and obesity was also seen in 18 women (8.6%). Other noted risk factors included grand multigravida in 13 women (6.1%), thyroid disorder 4.9% (10), twin pregnancy 3.7% (8) and congenital fetal anomaly, polyhydramnios, oligohydramnios each with 2.4% (5). **Conclusions:** This study significantly contributes to the body of knowledge on high-risk pregnancies and their outcomes.

INTRODUCTION

High-risk pregnancy (HRP) denotes a condition where the mother, the fetus, or both are predisposed to complications during the gestation period, at birth, or postnatally. Factors such as maternal age, pre-existing medical conditions, multiple pregnancies, and issues identified during pregnancy often contribute to a high-risk categorization [1, 2]. Developing nations, including Pakistan, encounter exacerbated challenges pertaining to the management and outcomes of HRPs due to limited healthcare resources, lack of accessibility to quality healthcare, and socio-economic disparities [3]. Annually, Pakistan witnesses over five million women embarking on the journey of pregnancy. Among these, a significant 15% (700,000) are likely to undergo obstetrical and medical complications. These complications, in turn, contribute to an alarming estimate of 30,000 pregnancy-related deaths each year. The Maternal Mortality Ratio (MMR) in the country is high at 276 deaths per 100,000 births each year [4]. This shows that there is a serious need for better care for pregnant women to improve the health of both mothers and babies. Hyderabad, a city with both city and rural areas, faces many healthcare problems like the rest of Pakistan. One big problem is that there isn't enough good information and plans to deal with high-risk pregnancies [6]. This

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makes it hard for doctors and families to know what to do. A lot of babies in Hyderabad are born too early, with 21.64% being born prematurely [7]. This shows that we need to do more to help these babies and their mothers. Also, the number of babies who are born dead has gone up from 3.98% to 5.75% over five years [8]. This shows that it's really important to have better plans and data to deal with high-risk pregnancies. Pakistan's hospitals, especially the big ones, deal with a lot of complicated medical, social, and economic issues when it comes to high-risk pregnancies [9]. By looking at what happens to babies and mothers in these situations, we can learn a lot that can help make policies and practices better, so that pregnancies and births are safer in Pakistan.

METHODS

A longitudinal study over two years, from October 1, 2020, to December 31, 2022 was conducted upon 213 high-risk pregnant women, chosen via continent sampling who attended the antenatal clinic Liaquat University Hospital, Hyderabad and Jamshoro. All those women who had either past miscarriages or difficult delivery due to medical conditions and those conditions were still present among the women were included in the study while those who lost the antenatal follow up, were excluded from the study. These women were tracked on a monthly basis until their delivery to scrutinize the unfolding of their pregnancies and the resulting perinatal outcomes. The study was approved by Institutional Ethical Review Committee (ERC) vide letter no: REC/167, dated: 09-08-2020. The study specifically included pregnant women visiting the antenatal clinic at Liaquat University Hospital, Hyderabad and Jamshoro, who had either current or past high-risk factors associated with their pregnancies. We collected data by using a set of questions that had been checked and approved beforehand. Before asking these questions, we made sure to get written permission from the people taking part. Interviews were conducted with the participants to collect data about their sociodemographic, obstetric and gynecological histories. Every visit encompassed a through antenatal and physical examination and requisite laboratory tests. Perinatal outcomes were evaluated on the 8th day post-delivery, during which details concerning maternal and fetal complications in terms of morbidity and mortality, were documented. The data were analyzed using SPSS (V21.0). Chi-square test was utilized for the statistical analysis, with a p-value <0.05 considered significant at a confidence interval of 95%. The categorical variables such as age, sociodemographic details, obstetric details, present and past high-risk characteristics, and their outcomes were tabulated and expressed as percentages.

RESULTS

The study on high-risk pregnancies among 213 expectant mothers unveiled various risk factors prevalent in the current pregnancy, as well as past pregnancies. The exploration of high-risk factors during the current pregnancy revealed that Rh-negative pregnancy topped the list with 24.4% (52) of the cases, followed by teenage pregnancy at 12.2% (26) and short stature at 10.9% (23). Additionally, severe anemia was found in 21 women (9.8%), Pregnancy Induced Hypertension (PIH) in 18 women (8.6%), and obesity was also seen in 18 women (8.6%). Other noted risk factors included grand multigravida in 13 women (6.1%), thyroid disorder 4.9% (10), twin pregnancy 3.7% (8) and congenital fetal anomaly, polyhydramnios, oligo-hydramnios each with 2.4% (5). The least common factors were breeching presentation, antepartum hemorrhage, and elderly primigravida each accounting for 1.2% (3) of the sample size (Table 1).

Table 1: Type of High-Risk Pregnancy (Current Pregnancy)

Characteristics	Frequency (%)
Maternal Age Factors	
Elderly Primigravida	3 (1.2%)
Teenage Pregnancy	26 (12.2%)
Physiological Factors	
Severe Anemia	21 (9.8%)
Pregnancy Induced Hypertension	18 (8.6%)
Rh-Negative Pregnancy	52 (24.4%)
Obesity	18 (8.6%)
Thyroid Problems	10 (4.9%)
Reproductive Factors	
Pregnancy with Twin	8 (3.7%)
Grand Multigravida	13 (6.1%)
Pregnancy Complications	
Short Stature	23 (10.9%)
Polyhydramnios	5 (2.4%)
Oligohydramnios	5 (2.4%)
Congenital Fetal Anomaly	5 (2.4%)
Abnormal Fetal Presentation	3 (1.2%)
Antepartum Hemorrhage	3 (1.2%)
Total	213 (100%)

When delving into the past pregnancy high-risk factors among the participants, the most common were previous caesarean with 29.4% (63), previous history of abortion with 24.5% (52), and previous history of neonatal or child death with 21.6% (46). Further, renal disorders, previous gynecological surgery, and Previous Pregnancy Induced Hypertension each were found in 2.9% (6) of the cases. The least common were known case of hyperthyroidism, heart disease, history of Sexual Transmitted Infection, previous twin pregnancy, previous malpresentation, thalassemia, lung disease, allergic illness, previous postpartum hemorrhage, and previous premature rupture of

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membrane each with less than 4% cases (Table 2).

Table 2: Type of Previous Pregnancies with increased risk

Characteristics	Frequency (%)
Past Reproductive History	
Past History of Caesarean	63 (29.4%)
Past History of Abortion	52 (24.5%)
Past History of Miscarriage or Fetal Death	46 (21.6%)
Past History of Gynecological Surgery	6 (2.9%)
Past History of Pregnancy -Induced Hypertension	6 (2.9%)
Presence of Hypothyroidism	6 (2.9%)
Presence of Hyperthyroidism	2 (0.9%)
Past History of Fetal Congenital Anomaly	4 (1.9%)
Past History of PPH	2 (0.9%)
Past History of PROM	2 (0.9%)
Past History of Pregnancy with Twins	2 (0.9%)
Past History of Abnormal Presentation	2 (0.9%)
Pre-Existing Medical Condition	
Renal Disorder	8 (3.9%)
Heart Disease	2 (0.9%)
H/o Sexual Transmitted Infection	2 (0.9%)
Thalassemia	2 (0.9%)
Lung disease	2 (0.9%)
Allergic Illness	2 (0.9%)
Total	213 (100%)

The evaluation of adverse fetal outcomes from the study presented a variety of challenges faced during the term of pregnancy. Low Birth Weight (LBW) was the most common adverse outcome, noted in 8 women (18.6%), followed by Neonatal Intensive Care Unit (NICU) admission in 7 cases (16.3%), and preterm birth in 6 cases (14.0%). Early neonatal death and abortion each were observed in 9.3% (4), similar to still birth and Intrauterine Death (IUD). Twins preterm was reported in 5 cases, accounting for 11.6% of the adverse outcomes. The total number of adverse fetal outcomes summed up to 43 (Table 3).

Table 3: Adverse Fetal Outcomes

Adverse Fetal Outcomes	Frequency (%)
Low Birth Weight (LBW)	8 (18.6%)
NICU Admission	7 (16.3%)
Preterm Birth	6 (14.0%)
Early Neonatal Death	5 (11.6%)
AbortionS	4 (9.3%)
till Birth	4 (9.3%)
Intrauterine Death (IUD)	4 (9.3%)
Twins Preterm	5 (11.6%)
Total	43 (100%)

DISCUSSION

The results of this study provide a glimpse into the multifaceted challenges encountered in managing high-risk pregnancies, and it's evident that the circumstances surrounding such pregnancies are complex and require multifaceted interventions. The prevalence of Rh-negative pregnancy, teenage pregnancy, and short stature as significant risk factors in the current pregnancy is consistent with literature from other regions. A study in Iran showed a significant correlation between maternal age, particularly teenage pregnancy, and adverse pregnancy outcomes, underscoring the global challenge posed by teenage pregnancies [10]. The finding on severe anemia resonates with a study conducted in Nigeria, which highlighted the impact of severe anemia on maternal and fetal outcomes, emphasizing the importance of early detection and management [11]. Similarly, Pregnancy-Induced Hypertension (PIH) has been a recurring theme in many studies as a significant high-risk factor. A study from Nepal affirmed the association between PIH and adverse perinatal outcomes [12]. The scenario of past pregnancy high-risk factors such as previous caesarean, history of abortion, and neonatal or child death mirrors the findings from a study in Bangladesh which showed that a history of cesarean section significantly increased the likelihood of adverse pregnancy outcomes [13]. A study published in the American Journal of Obstetrics and Gynecology, reported a history of abortion as a probable linked to preterm birth in succeeding pregnancies [14]. When we talk about problems with babies being born, like low birth weight, needing special care in the NICU, and being born too early, it's happening a lot around the world. A study in Taiwan showed that when babies are born too early or too small, they're more likely to have health problems and even die soon after birth [15]. The rates of babies dying soon after birth, having abortions, and being stillborn in this study show that we need to look more closely at how good and easy it is for pregnant women to get care before they give birth [16, 17]. High-risk pregnancies, where there's a greater chance of something going wrong, are a big problem all over the world. The problems we saw in this study with babies are part of bigger challenges in taking care of pregnant women and babies. We already know it's important to find out early if a pregnancy is high-risk and to take care of it right. A study in Ethiopia showed that getting care early in pregnancy can make a big difference in how well the pregnancy goes, especially if it's high-risk [18]. Taking care of high-risk pregnancies doesn't stop when the baby is born. A study in the UK showed that it's important to keep checking on the mom and giving her support, even after the baby is born, especially if she might get pregnant again [19]. When we look at different places in the world, we see that some things make pregnancy riskier. For example, in richer countries like China, being overweight or having problems with the thyroid gland is more common [20]. But in poorer countries like Bangladesh, severe anemia is more common because people don't get enough of the right food [21].

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CONCLUSIONS

This study adds important information to what we already know about high-risk pregnancies and what happens to the babies. But we still need more research to understand better why these problems happen and how we can find them early, treat them, and stop them from happening in the first place. This will help make things better for moms and babies all over the world.

Authors Contribution

Conceptualization: SG,
Methodology: SC, SD, FL, HS
Formal analysis: SG
Writing-review and editing: SG, SC, SD, FL, HS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Frequency of Depressive Symptoms in Women with Polycystic Ovary Syndrome and Obesity versus Women with Polycystic Ovary Syndrome without Obesity

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ABSTRACT

Polycystic Ovary Syndrome (PCOS) is a complicated hormonal condition that impacts women globally. Its association with obesity and its potential impact on mental health, specifically depressive symptoms, has gained increasing attention. This study aimed to determine the relationship between depressive symptoms and PCOS in women, with a focus on the influence of obesity. **Objective:** To compare the frequency of depressive symptoms among women who have PCOS, categorized based on whether they are obese or not. **Methods:** A cross sectional descriptive study was conducted on electronic medical records of 194 women with PCOS from a tertiary care hospital. Data included demographic information, clinical characteristics of PCOS, and depressive symptom scores measured using the Center for Epidemiologic Studies-Depression (CES-D) scale. The study was conducted from Apr 2021 to Oct 2021 for a period of 6 months. **Results:** Women with PCOS and obesity exhibited significantly higher mean CES-D scores and a higher prevalence of clinically significant depressive symptoms (CES-D ≥ 16) compared to those without obesity. Hyperandrogenism, oligomenorrhea, and hirsutism were more prevalent in women with PCOS and obesity. **Conclusions:** The study found out that women with PCOS and obesity appear to be at a higher risk of experiencing clinically significant depressive symptoms. Healthcare providers should consider the mental health needs of this population, emphasizing a multidisciplinary approach to care.

INTRODUCTION

Polycystic Ovary Syndrome (PCOS) is a common hormonal imbalance, affecting an estimated 6–10% of Pakistani women [1]. Among obese adolescent girls in the country, this rate is considerably higher, falling between 18–27% [2]. Typical clinical symptoms of PCOS include signs of hyperandrogenism such as irregular menstruation, excessive body hair, and acne. Additionally, both adult women and young girls with PCOS face an increased risk of associated health issues, including Type 2 diabetes, fertility problems, heart disease, weight problems, elevated insulin levels, insulin resistance, and other metabolic conditions [3]. New studies suggest that adult women suffering from PCOS are more prone to mental health challenges, particularly symptoms associated with internalizing disorders. A thorough meta-analysis that included 18 studies from different areas showed that in Pakistan, adult women with PCOS are three times more likely to experience depression and five times more likely to have anxiety when compared to women without the disorder [4]. Another long-term study that followed 83

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adult women with PCOS for 25 years found consistently higher scores for depression symptoms, as measured by the Center for Epidemiologic Studies-Depression (CES-D) scale, in comparison to women not diagnosed with PCOS [5]. The study indicated that women with PCOS were twice as likely to screen positively for depression compared to those without the condition. The underlying reasons for the heightened prevalence of depressive symptoms among women with PCOS are still not entirely understood but could be related to the severity of physical symptoms like hirsutism, metabolic issues, and infertility problems. Additionally, it is hypothesized that symptoms of depression might be involved in the development of PCOS, possibly via stress-related behavioral and physiological pathways [6]. While research has been conducted on the prevalence of depression in adult women with PCOS, there is a gap in knowledge about the extent and contributing factors of depression in younger individuals with PCOS. In Pakistan, around 11% of adolescents are diagnosed with depression, and girls are two to three times more likely to suffer from major depressive disorder than boys [7]. For girls dealing with obesity or metabolic issues, the incidence of depression ranges from 12% to 21% [8]. Hamman *et al.*, revealed that young individuals with obesity and Type 2 Diabetes (T2D) had higher depressive symptoms, as measured by the CES-D scale, compared to those with Type 1 Diabetes (T1D) who were not obese [9]. A considerable number of these adolescents with T2D had CES-D scores exceeding the threshold of 16, signaling significant depressive symptoms and necessitating further evaluation for depression [10]. Likewise the Copeland *et al.*, study which included 704 young people with T2D aged between 10 and 17 and with a BMI in the 85th percentile or higher, found that 17% of the girls had elevated levels of depressive symptoms [11]. Given these heightened rates of depression among adolescents with obesity and T2D, along with the increased risk of depression in adult females with PCOS, there's a critical need to study the prevalence of depression in young individuals with both PCOS and obesity, a demographic yet to be adequately studied in Pakistan.

The rationale of this study was to explore whether adolescent girls with PCOS and obesity would demonstrate similar levels of depression symptoms as girls without obesity. Therefore, the objectives of this study were to compare depressive symptoms among women with obesity and without obesity that have PCOS.

METHODS

This cross sectional descriptive study was conducted at Liaquat University Hospital, Hyderabad from Apr 2021 to Oct 2021 for a period of 6 months. The initial selection criteria for participants' enrollment included female gender with age range between 11 and 17 years and having presence of polycystic ovaries or irregular menses. The participants were chosen via non-probability purposive sampling. Females with already established psychiatric diagnosis, having Cushing syndrome or metabolic disorder were excluded from the study. Sample size was calculated using Open Epi sample size calculator via taking prevalence of PCOs in obese female adolescents in Pakistan as 23.3% with 5% margin of error and 90% confidence interval [2]. The diagnosis of PCOs was made in accordance with the guidelines established by the Endocrine Society (including criteria such as oligomenorrhea lasting for more than 2-years history of amenorrhea and biochemical hyperandrogenism, with no other underlying cause for oligomenorrhea or elevated androgens). Ultrasound of all women was done to assess the number of cysts in the ovaries. Girls were categorized into obese and non-obese on the basis of BMI. The depressive symptoms were assessed by CES-D. The data were analyzed via SPSS version 24.0. Mean ± SD was calculated for quantitative variables while frequency and percentages were calculated for qualitative variables.

RESULTS

The mean age of women with PCOS and obesity was 25.5 ± 3.2 years, while those with PCOS without obesity had a slightly higher 26.0 ± 2.8 years. The average BMI value for women with PCOS and obesity was substantially higher 30.4 ± 2.7, compared to those without obesity, who had an average BMI value of 22.3 ± 2.1. In terms of education level, a similar distribution was observed in both groups, with a significant proportion holding a Bachelor's degree. Employment status showed that a higher percentage of women with PCOS and without obesity were employed compared to those with PCOS and obesity.

Table 1: Demographic Characteristics

Characteristics	PCOS with Obesity (n=90)	PCOS without Obesity (n=104)	Total (n=194)
Age (Mean ± SD)	25.5 ± 3.2	26.0 ± 2.8	25.8 ± 3.0
BMI (Mean ± SD)	30.4 ± 2.7	22.3 ± 2.1	26.3 ± 4.0
Education Level			
Uneducated	25 (27.8%)	28 (26.9%)	53 (27.3%)
High School	25 (27.8%)	28 (26.9%)	53 (27.3%)
Bachelor's Degree	40 (44.4%)	48 (46.2%)	88 (45.4%)
Employment Status			
Employed	25 (27.8%)	36 (34.6%)	61 (31.4%)
Unemployed	65 (72.2%)	68 (65.4%)	133 (68.6%)

Table 2 reveals that the duration of PCOS was similar in both groups, with women in the PCOS with obesity group having 5.7 ± 1.2 years, and those without obesity having 5.3 ± 1.0 years. Notably, hyperandrogenism was more prevalent among women with PCOS and obesity, with 75.6% of this group exhibiting this clinical characteristic compared to

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50.0% in the PCOS without obesity group. Oligomenorrhea was also more common in the PCOS with obesity group, with 91.1% experiencing it, while 73.1% of women without obesity had this condition. Hirsutism was observed in 66.7% of women with PCOS and obesity, whereas it was present in 34.6% of women without obesity.

Table 2: Clinical Characteristics

Characteristics	PCOS with Obesity (n=90)	PCOS without Obesity (n=104)	Total (n=194)
Duration of PCOS (Years)	5.7 ± 1.2	5.3 ± 1.0	5.5 ± 1.1
Hyperandrogenism	68 (75.6%)	52 (50.0%)	120 (61.9%)
Oligomenorrhea	82 (91.1%)	76 (73.1%)	158 (81.4%)
Hirsutism	60 (66.7%)	36 (34.6%)	96 (49.5%)

Table 3 presents the scores for depressive symptoms, as measured by the CES-D (Center for Epidemiologic Studies-Depression) scale. Women diagnosed with both PCOS and obesity showed a higher average CES-D score of 22.8 (with a standard deviation of 4.7). In contrast, those without obesity had a lower average score, registering at 18.5 (with a standard deviation of 3.9). The median CES-D score for women with PCOS and obesity was 23 (IQR: 20-26), while for those without obesity, it was 19 (IQR: 16-22). Additionally, a notably higher percentage of women with both PCOS and obesity, specifically 75.6%, had CES-D scores of 16 or above. This score is a marker for significant depressive symptoms. On the other hand, only 46.2% of women without obesity reached this threshold for depression. In comparison, only 24.4% of women with PCOS and obesity had CES-D scores below 16, while 53.8% of women without obesity fell into this category.

Table 3: Depressive Symptoms Scores (CES-D)

CES-D Score Range	PCOS with Obesity (n=90)	PCOS without Obesity (n=104)	Total (n=194)
Mean ± SD	22.8 ± 4.7	18.5 ± 3.9	20.7 ± 4.3
Median (IQR)	23 (20-26)	19 (16-22)	21 (18-24)
CES-D ≥ 16 (n, %)	68 (75.6%)	48 (46.2%)	116 (59.8%)
CES-D < 16 (n, %)	22 (24.4%)	56 (53.8%)	78 (40.2%)

DISCUSSION

The study reported a significant increase in prevalence of depressive symptoms among girls with PCOs and Obesity in comparison to girls having PCOS without Obesity. The mean age difference between women with PCOS and obesity and those without obesity, though statistically significant, is relatively small (25.5 years vs. 26.0 years). This finding aligns with the general understanding that PCOS can affect women of various age groups. However, it's important to note that the average BMI in the PCOS with obesity group (30.4) is considerably higher than that in the PCOS without obesity group (22.3). This observation mirrors the well-established association between PCOS and obesity. This aligns with multiple studies conducted both nationally and internationally, which have consistently shown a robust correlation between PCOS and obesity. Often, obesity worsens the clinical symptoms of PCOS, such as irregular menstrual cycles and hyperandrogenism [12]. For instance, research by Escobar-Morreale *et al.*, in 2012 revealed that obesity is linked to more pronounce clinical and biochemical signs of hyperandrogenism in women with PCOS [13]. The distribution in educational level of participants is very much similar in both groups. A substantial proportion in both groups was having Bachelor's degrees. This suggests that education level might not be a significant differentiating factor in this context opposing to the study by Hopkins *et al* [14]. But a more close investigation into the socioeconomic factors affecting women with PCOS, suggest a link of higher socioeconomic status in easy access to healthcare, and mental health support. The duration of PCOS among both groups was not much different, which indicates that there is not any significant association present between obesity and duration of PCOS. This matches what other studies have found: PCOS tends to stick around regardless of weight [15]. More women with PCOS and obesity had high levels of male hormones (75.6%) compared to those without obesity (50.0%). This shows how PCOS, obesity, and hormone imbalances are all connected. Other studies have seen similar patterns. For example, Azziz *et al.*, in 2016 pointed out how having too much male hormone is a big part of PCOS, and obesity can make it worse [16]. In women with PCOS and obesity, a higher percentage experienced irregular periods (91.1%) compared to those without obesity (73.1%). This matches what other studies have found; showing that being obese can worsen period problems in PCOS. International studies, like one by Yildiz *et al.*, in 2012 have consistently shown a link between obesity and menstrual issues in PCOS [17]. Excess body hair (hirsutism) was more common in women with PCOS and obesity (66.7%) compared to those without obesity (34.6%). This lines up with research showing that obesity can impact the symptoms of PCOS, especially those related to too much male hormone, like excess hair growth. International studies, such as one by O'Reilly *et al.*, in 2014, have also highlighted how obesity can make hirsutism worse in PCOS [18, 19]. It's clear that women who have both PCOS and obesity tended to have higher average scores on the CES-D, which suggests more severe depressive symptoms, compared to those without obesity. Additionally, a noticeably larger number of women with both conditions scored above the threshold of 16 on the CES-D, indicating clinically significant depressive symptoms. This suggests a possible link between obesity and more severe depression symptoms in women with PCOS [20]. Many studies conducted both in the United States and internationally have explored the relationship between PCOS, obesity, and depression symptoms. For example, a study by Dokras *et*

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al., in 2011 in the United States found that women with both PCOS and obesity are more likely to experience depression compared to those who are not obese [21]. Similarly, research by Cooney *et al.*, in Australia in 2017 also discovered a higher occurrence of depression among women with both PCOS and obesity [22]. However, it's important to recognize that the link between PCOS, obesity, and depressive symptoms is intricate and influenced by various factors. This may include biological aspects related to hormonal imbalances, psychological factors tied to body image and self-esteem, and sociocultural factors impacting how women perceive and manage their condition.

CONCLUSIONS

This study unearths the complex relationship among PCOS, obesity, and depressive symptoms. The study found out that women with PCOS and obesity appear to be at a higher risk of experiencing clinically significant depressive symptoms. Healthcare providers should consider the mental health needs of this population, emphasizing a multidisciplinary approach to care.

Authors Contribution

Conceptualization: SF
Methodology: AA, HS
Formal Analysis: SF, AA
Writing, review and editing: SF, AN, AA, SB, FL, HS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

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Original Article

Violence-Related Injuries: The Most Common Cases in Hyderabad, Pakistan.

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ABSTRACT

The law influences every aspect of human activity, including medical practice. The nature of casualty is affected by geographical regions, cultures, and social values. Determining characteristics of casualty can guide health policy and can assist in managing healthcare resources. **Objective:** To profile the cases at casualty department of a tertiary teaching hospital. **Methods:** The study was conducted at the casualty department of Liaquat University Hospital Hyderabad, Pakistan and Department of Forensic Medicine & Toxicology LUMHS, Jamshoro, over a period of one year from January 2021 to December 2021. A total of 3,487 cases were recorded and categorized into violence-related, transportation-related, substance-related, and sexual assault-related injuries. **Results:** The majority of cases were violence-related incidents (84.65%), followed by transportation-related accidents (14.65%), substance-related injuries (3.61%), and sexual assault-related injuries (0.69%). Violence-related injuries were divided into assault cases, firearm incidents, and police torture. Transportation-related injuries were categorized as road traffic accidents and train accidents. Assault and road traffic accidents were the leading cause of violence-related and transportation-related injuries, respectively. The highest numbers of cases were observed in April, June, and May. **Conclusions:** A substantial portion of cases at casualty department of Liaquat University Hospital, Hyderabad is contributed by violence-related injuries.

INTRODUCTION

Medico-legal cases are injuries that require investigation to determine responsibility for the cause of injury through law enforcement agencies. These cases may involve injuries that suggest offenses or accidental injuries, all unnatural deaths, suspected sexual assault, suspected criminal abortion, unconsciousness with a clear cause, suspected poisoning or intoxication, cases referred from court, cases that are brought dead with suspected offense, suspected self-inflicted injuries or suicidal attempts, and any other case of legal importance [1]. Such cases may be presented directly to the hospital, where the physician examines the case and identifies the need for legal investigation by the constabulary. Besides, law enforcement agencies can also refer such cases to the physician to get aid in investigation or other law requirements [2].It is becoming increasingly clear that every hospital has cases that carry legal implications significant enough to categorize them as medicolegal cases. With more and more doctors being summoned to Courts of Law or Medical Tribunals to address inquiries regarding patients under their care, it is evident that medico-legal issues can surface at any point during medical treatment, even after death of patients. Courts may request all medical records of a patient for review, underscoring the importance of understanding the characteristics of medico-legal cases [3]. Some doctors

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avoid dealing with medico-legal cases due to the lengthy legal procedures, disputes, and political pressures that can disrupt their routine practice and social life [4]. However, clear institutional guidelines are necessary to handle medico-legal cases properly, and almost all hospitals and teaching institutions have an 'institutional medico-legal manual.' Even if no such manual is available, Medico-legal cases do not pose any problem if dealt with proper caution, care, and attention, such as appropriate documentation, information, thorough examination, necessary investigations, and referral if required [5]. A registered medical practitioner is responsible for judging every MLC correctly and informing the law enforcement authorities to save themselves from unnecessary allegations in the future [6]. MLC cases are usually observed in common practice in the sub-continent to pressure the opposite party in a clash, take revenge, or obtain an extra favor from the judiciary. The nature, frequency, and percentage of medico-legal cases vary from region to region and have some seasonal variations[7].

Analyzing medico-legal cases helps public health authorities identify patterns and trends in injuries, illnesses, and fatalities within a population. This information is vital for developing and implementing effective prevention strategies and interventions to reduce the incidence of preventable injuries and deaths. Therefore, the present study was conducted with the aim determining the characteristics of medico-legal cases at Liaquat University Hospital, Hyderabad, Pakistan.

METHODS

This cross-sectional study was carried at the casualty department of Liaquat University Hospital, Hyderabad and Department of Forensic Medicine & Toxicology, LUMHS, Jamshoro, which was chosen as the primary location for data collection due to its status as the main tertiary care hospital in the region. The study was conducted from January 2021 to December 2021 after approval ref no. LUMHS/FM/178/19, dated 28-11-2019, and utilized consecutive sampling as a non-probability method to select patients of all genders and age groups requiring trauma medicine care as the inclusion criteria, while cases of emergency medicine other than trauma cases were excluded. Cases with violence related injury, transportation related injuries, substance related and sexual assault were studied, such as assault, police torture, fire arm, road traffic accidents, drugs, alcohol, poison abuse and rape. The data collected was analyzed using SPSS version 22.0.

RESULTS

A thorough initial assessment of cases was performed to determine extent of the injury and identify any life-threatening conditions. This involved assessment of vital signs, airway, breathing, and circulation. Depending on the assessment and need of the care, immediate interventions were implemented to stabilize the patients accordingly, including, controlling haemorrhage, ensuring normoxia, ventilation, checking for suspected fractures spinal injuries, limiting contamination to wounds and injuries, managing pain, and using prophylactic antibiotics, where required clinically. Once stabilized, the cases in casualty department were subjected to comprehensive medical evaluation through physical assessment, imaging studies, and laboratory examination and recommended for specific interventions or hospitalization based on the type of injury and clinical needs. In this study majority of cases were males accounted 2940 (84.31%) and 547 (15.69%) were females shown in Figure 1.

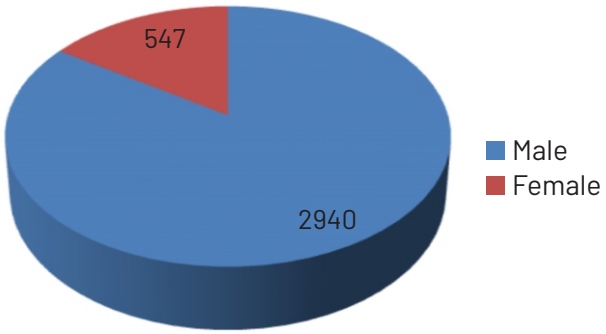

Figure 1: Baseline details of cases

The cases were categorized as violence-related, transportation-related, substance-related, and sexual assault-related injuries shown in Table 1. The majority of cases were violence-related injuries, accounting for 84.65% (2,952) of cases, in which 2756, 191, and 3 were assault, fire arm and police torture. Transportation-related injuries were 14.65% (511), substance-related injuries at 3.61% (126), and sexual assault-related injuries at 0.69% (24). Road traffic accidents contributed largely to transportation-related injuries by causing more than 95% of injuries. Violence-related injuries were further divided into assault cases, firearm incidents, and police torture. Among these, assault cases had the highest contribution at 93.57% (2,758) followed by firearm incidents at 6.47% (191). In substance- and sexual assault-related injuries, alcohol intoxication and rape showed a higher proportion(73% and 79%, respectively) than poisoning and sodomy (27% and 21%, respectively).The highest number of cases were observed in April at 10.04% (350), followed by June at 10.8% (376), May at 10.53% (367), and July at 9.04% (315). The lowest number of cases was observed in November at 6.74% (235).

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Table 1: Month-wise distribution of cases

Month	Assault	Violence-related injuries			Transportation-related injuries			Substance-related injuries			Sexual assault-related injuries			Total
		Fire Arm	*Police torture*	Total	*Road*	*Train*	Total	*Alcohol*	*Poison*	Total	Rape	Sodomy	Total	
January	174	36	-	210 (86.42%)	31	-	31 (12.76%)	3	-	3 (1.23%)	1	1	2 (0.82%)	243
February	174	18	-	192 (76.8%)	36	20	56 (22.4%)	7	9	16 (6.4%)	2	-	2 (0.8%)	250
March	192	26	-	218 (84.5%)	39	-	39 (15.12%)	8	-	8 (3.1%)	1	-	1 (0.39%)	258
April	287	11	-	298 (85.14%)	50	-	50 (14.29%)	19	3	22 (6.29%)	1	1	2 (0.57%)	350
May	316	8	2	326 (88.83%)	40	1	41 (11.17%)	12	2	14 (3.81%)	-	-	=	367
June	320	12	-	332 (88.83%)	42	-	42 (11.17%)	10	1	11 (2.93%)	1	1	2 (0.53%)	376
July	252	18	1	271 (86.03%)	39	1	40 (12.7%)	5	1	6 (1.9%)	3	1	4 (1.27%)	315
August	258	14	-	272 (86.62%)	40	-	40 (12.74%)	7	-	7 (2.23%)	2	-	2 (0.64%)	314
September	242	17	-	259 (84.64%)	44	-	44 (14.38%)	3	2	5 (1.63%)	3	-	3 (0.98%)	306
October	189	14	-	203 (85.29%)	34	-	34 (14.29%)	2	3	5 (2.1%)	1	-	1 (0.42%)	238
November	193	5	-	198 (24.26%)	33	-	33 (14.04%)	3	11	14 (5.96%)	3	1	4 (1.7%)	235
December	161	12	-	173 (73.62%)	61	-	61 (25.96%)	13	2	15 (6.38%)	1	-	1 (0.43%)	235
Total	2758	191	3	2952 (84.65%)	489	22	511 (14.65%)	92	34	126 (3.61%)	19	5	24 (0.69%)	3487

The distribution of cases into various categories is presented in Figure 2.

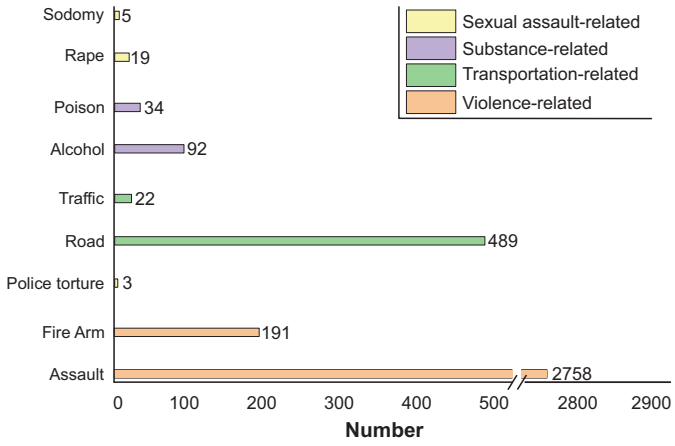

Figure 2: Number of cases in different categories

DISCUSSION

Medico-legal cases have been the subject of numerous international studies, highlighting their significance in the field. A study conducted in Saudi Arabia found that fight and physical assault or battery mainly contributed a larger proportion (83%) of medicolegal cases [1]. A study conducted by Tomar *et al.*, [8] it was found that the majority of medico-legal cases (81.84%) were accidental cases while 9.73% were categorized as suicidal cases and 8.42% as homicidal cases. However, the present study found different results, revealing that violence-related injuries accounted for the highest number of cases at 84.65%. This was followed by transportation-related injuries at 14.65%, substance-related injuries at 3.61%, and sexual assault-related injuries at 0.69%. Similar findings have also been reported from other regions. Violence-related injuries dominated the medico-legal cases in a study conducted in Indonesia [9]. Similarly, Zaghloul and Megahed [10] reported violence as the common cause leading to homicide among Egyptian women. Violence has been referred as serious pandemic in certain parts of the world [11]. Pakistan, a country with higher rural population than urban settings and with a comparatively low literacy rates, has also been reported for substantial number of violence-related cases [12-14]. A study of 149 medico-legal cases from Punjab province of Pakistan found that a major proportion (79%) of medico-legal cases had an injury due to use of blunt as weapon of offence [14]. A descriptive cross-sectional study of 328 medico-legal profiles in Nepal [15] found distribution of violence-related cases similar to the present study. Out of 328 cases brought to the hospital for medicolegal concerns, 237 cases (72.25%) were found to have injuries, with a 95% confidence interval ranging from 67.40% to 77.09%. Among these cases, 170 (71.73%) were attributed to physical assault, while 64 (27%) were a result of accidents [15].Interestingly, the monthly distribution of medico-legal cases also varied across different studies. For instance, Tomar *et al.*, [8] reported the highest number of cases in March (11.11%) and September (9.28%), while our study identified June (10.67%) as the month with the highest number of cases, followed by April (10.23%). These

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discrepancies in findings highlight the importance of considering contextual factors and regional variations when analyzing MLC data. Research conducted by Siddappa and Datta [16] revealed different proportions of medicolegal cases, with accidental cases being the highest at 69.03%, followed by suicidal cases at 20.24% and homicidal cases at 10.72%. Similarly, Yadav and Singh [17] found assault cases to be the most prevalent at 39.6%, followed closely by accidental cases at 38.1%. In contrast, a study by Malik *et al.*, [18] identified poisoning as the most frequently observed case. This study also reported that August had the highest number of medico-legal cases at 10.41%, with road traffic accidents comprising 38% of the cases, physical assaults accounting for 32%, and sharp weapon injuries making up 19% of the cases. Sexual violence is a prevalent public health concern encompassing legal, medical, physical, psychological and social dimensions [19]. Sexual violence is described as any sexual activity or any effort to engage in sexual activity through force or coercion. This definition, as outlined by the World Health Organization (WHO), covers a range of scenarios including rape within marriage, stranger rape, sexual exploitation, abuse of individuals with disabilities, child sexual abuse, forced marriage, child marriage, denial of access to contraception or prevention of sexually transmitted diseases, and coerced abortion [20]. For millions of victims worldwide, predominantly women, it stands as a harsh and brutal reality.19 Men can also experience sexual violence, but determining general prevalence rates remain challenging due to underreporting. Incidents of violence against men and boys often go unreported at a higher rate. In present study, least number of medico-legal cases were characterized under category of sexual assault. The sexual and domestic violence is often reported in medicolegal profiling throughout the world [21]. However, the prevalence of sexual violence is reported to be comparatively less in developing countries and, particularly, in Muslim societies [19, 22]. Thus, the characteristics of medico-legal cases in the present study are consistent to that from other developing or Islamic societies [23].

CONCLUSIONS

Violence-related injuries were found to be most commonly reported medico-legal presentations followed by transportation-related injuries in the Hyderabad region of Pakistan's Sindh province. The present study underlines the need of public awareness programs on reducing physical violence-involving clashes and increasing transportation-related safety.

Authors Contribution

Conceptualization: IB
Methodology: IB, MRS, AS, NA, AR
Formal analysis: MRS, UM,
Writing-review and editing: IB, UM, AS, NA, AR

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Early Complications of Endoscopic Third Ventriculostomy in Obstructive Hydrocephalus

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ABSTRACT

Obstructive hydrocephalus (HCP) occurs when cerebrospinal fluid is blocked leading to the enlargement of ventricular pathways stream resulting into increase pressure within skull. Endoscopic third ventriculostomy (ETV) is considered an effective management strategy for hydrocephalus especially for third/fourth ventricle level. **Objective:** To study the per-operative and post-operative early complications of endoscopic third ventriculostomy in obstructive hydrocephalus patients. **Methods:** This prospective study was conducted at Department of Neurosurgery, Liaquat University Hospital, Hyderabad, from 1st January 2020 to 31st December 2022. One hundred and fifty patients were included. All the cases, were underwent general anesthesia and elective surgery was performed in them. The patients were followed post operatively for 7 days in context to cerebrospinal fluid (CSF) leakage, wound infection, bleeding, seizures as well as meningitis. **Results:** Seventy six (50.7%) were males and 74 (49.3%) were female. Mean age was 5.5 ± 2.3 years with maximum number of patients (70.7%) were under or equal the age of 5 years. Complications occurred in 18 patients (12%) out of 150 patients. Cerebrospinal fluid leakage was the most common complication occurred in 5 (3.33%) patients, wound infection was seen in 2 (1.3%) patients, meningitis developed in 3 (2%) patients, minor bleeding was seen in 3 (2%) patients, seizures developed in 4 (2.6%) patients, in hospital mortality occurred in 1 (0.66%) patient on 3rd post-operative day. **Conclusions:** Ventriculostomy appeared to be the better surgical approach for obstructive hydrocephaly management. Minimum numbers of associated complications were observed in present study group.

INTRODUCTION

Obstructive hydrocephalus (HCP) occurs when cerebrospinal fluid is blocked leading to the enlargement of ventricular pathways stream resulting into increase pressure within skull. This is commonly caused by Aqueductal stenosis and tumors leading to blockage of one or more of the passages which are responsible for ventricle connection. In a systematic review and meta-analysis of population-based epidemiological studies, overall hydrocephalus global prevalence of 85/100,000. When stratified by age groups, the global prevalence of hydrocephalus is 88/100,000 in the pediatric population, 11/100,000 in adults and 175/100,000 in the elderly and potentially >400/100,000 in those >80 years of age [1]. The prevalence of hydrocephalus is significantly higher in Africa and South America when compared to other continents. Endoscopic third ventriculostomy (ETV) is considered an effective management strategy for hydrocephalus especially for third/fourth ventricle level [2, 3]. Endoscopic third ventriculostomy is a surgical procedure in which small stoma has to be created on the floor of third ventricle to divert CSF pathways from ventricular system to inter-peduncular and pre-pontine cisterns to bypass CSF ventricular pathway, lessen the symptoms of hydrocephalus [4, 5]. Large number of

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studies performed on pediatric population demonstrated that children gave inherent results which show favorable outcomes in surgery. Although large number of ETV complications are due to the procedure itself but overall mortality rate is ranging between 0.2-1.2%. Morbidity risk is also associated with this therapeutic procedure which is up to 2.38% [6-8]. The endoscopic third ventriculostomy has revolutionized the world of medical sciences by increasing the life expectancy and quality of life of hydrocephalus patients. Certain complications are also associated with this surgical procedure including fever, diabetes insipidus, gaze palsy, hemiparesis, impaired consciousness, memory disorders, uncontrolled bleeding as well as precocious puberty. Some other related implications such as CNS infection, subdural hemorrhage, CSF leakage, hematoma and epilepsy are also reported by few other researchers as well [9-12].

Present study was designed for the estimation of pre-operative and post-operative early complications of endoscopic third ventriculostomy in obstructive hydrocephalus in a hospital based study setting of Pakistan.

METHODS

This prospective study was conducted at Department of Neurosurgery, Liaquat University Hospital Hyderabad from 1st January 2020 to 31st December 2022 after approval ref no. LUMHS/NS/075. Patients fulfilling the inclusion criteria as suffering from obstructive hydrocephalus and admitted in neuro-surgery ward for their further workup were included in the study. Non-probability consecutive sampling technique was used for data collection. A total of 150 cases was enrolled post sample collection through WHO sample size calculator-based Software applying 5% margin error and 95% confidence interval. Those cases having lesion close to basilar artery or in the region of third ventricle floor were excluded from the study. In addition to this, cases having third ventricle measurement less than 7mm, and diagnosed through CT scan for the same were also excluded from the research. Patient's complete clinical history, clinical examination and diagnostic examination which included computerized tomography, imaging and magnetic resonance indexing of brain were documented through a well-structured questionnaire. The clinical as well as demographic information related to the patient were also recorded in the questionnaire. All the cases, were underwent general anesthesia and elective surgery was performed in them. The patients were followed post operatively for 7 days in context to Cerebrospinal Fluid (CSF) leakage, wound infection, bleeding, seizures as well as meningitis. Gender, overall complications, and pattern of problems (e.g., cerebrospinal fluid leak, wound infection, meningitis, seizures, hemorrhage, and in-hospital mortality) were estimated using frequencies and percentages. The data were entered and analyzed through SPSS version 26.0 for analysis.

RESULTS

The mean age of the study participants was5.5±2.3 years with maximum number of patients (50.7%) were under or equal the age of 5 followed by 22.6% in the age group of 6-10 years whereas least number of patients were observed in >20 years age group (8.7%). There were 76 (50.7%) males and 74 (49.3%) females (Table 1).

Table 1: Demographic Characteristics of Patients (n=150)

Variables	Frequency (%)
Age (Years)	
≤5	76 (50.70)
6 to 10	34 (22.6)
11 to 15	13 (8.7)
16 to 20	14 (9.3)
>20	13 (8.7)
Gender	
Female	74 (49.3)
Male	76 (50.7)

The various complications observed in the cases were CSF leakage, seizures, minor bleeding, meningitis, wound infection and in hospital mortality (Table 2).

Table 2: Distribution of Complications among Cases (n=150)

Complications	Frequency (%)
CSF Leakage	5 (3.3)
Wound Infection	2 (1.3)
Meningitis	3 (2)
In-Hospital Mortality	1 (0.6)
Minor Bleeding	3 (2)
Seizures	4 (2.6)
Total No.	18 (12)

There was a higher risk of complication within the early years of life. The highest numbers of cases were observed in cases ≤ 5 years of age, followed by those within the age group of 6-10 years. There was no case of meningitis, seizures and bleeding in patients >10 years (Table 3).

Table 3: Comparison of Complications According to Age (n=150)

Complications	Age (Years)				
	≤5	6-10	11-15	16-20	>20
CSF Leakage	3 (2%)	1 (0.6%)	-	-	1 (0.6%)
Wound Infection	1 (0.6%)	1 (0.6%)	-	-	-
Meningitis	2 (1.3%)	1 (0.6%)	-	-	-
In-Hospital Mortality	1 (0.6%)	-	-	-	-
Minor Bleeding	2 (1.3%)	1 (0.6%)	-	-	-
Seizures	3 (2%)	1 (0.6%)	-	-	-

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DISCUSSION

Hydrocephalus is a prevalent disorder approximately ranging between 1-1.5% all over the globe. In the past decade, much progress has been made in the management of this disorder. Shunt was more commonly used in previous times but due to large number of associated risk, its usage has been extensively declined in recent years. Advancement in the field of medical sciences led to the development of more appropriate protocol adoption for the treatment of obstructive hydrocephalus. Ventriculostomy is an advanced protocol for hydrocephalus management. In present study, per-operative and post-operative early complications of endoscopic third ventriculostomy in obstructive hydrocephalus patients were observed and recorded [13-15]. In the present study, majority of the patients were less than 5 years of age. Among patients, almost equal number of males and females were observed in present study. Cerebrospinal fluid leakage appeared to be the most prominent complication associated with ventriculostomy followed by seizures, meningitis, minor bleeding and meningitis. Literature also reported the similar values for complication rate and associated implications for ventriculostomy [16-19].Different studies reported CSF leakage is the most prominent and frequent complication observed in endoscopic third ventriculostomy [20, 21]. In current study leakage occurred in 5 patients (3.3%). In the studies by Jung et al., and Bouras and Sgouros reported cerebrospinal fluid leakage in 1.61% of patients [22, 23], and in another study it is reported as 1.7% and go as high as 5.2% in literature, CSF leakage rate is little bit higher in our study. This can be caused by increased intraventricular pressure which generally occurs post-operatively. It is normally considered as the first sign of ETV failure but can be recovered by serial LP and resuturing of the skin incision. Post-operative seizures were seen in 4 patients (2.6%), anti-epileptic drugs were started, 3 patients had good control of seizures one patient suddenly deteriorated and lead to in hospital mortality, Bouras and Sgouros reported 0.21% seizures rate [23]. Wound infection is another major complication that frequently observed in the ETV. In our study wound infection occurred in 2 patients (1.3%) both cases occurred in patients with CSF leakage, treated initially with broad spectrum antibiotics and serial LPs then with antibiotics as per culture. Meningitis and ventriculitis are mainly reported in the range of 0.1-6.1% [24-26]. In present study, 3 patients (2%) developed meningitis in patients with CSF leakage; Bouras and Sgouros [23] reported 1.60% of patients developed meningitis which is close to the rate of current study. Only few studies cite bleeding and mortality related to ETV. Bouras and Sgouros in his review, reports 3.7% of bleeding incidents whereas in other study reports minor bleeding in 16.5% of patients, in present study minor bleeding occurred in 3 patients (2%) [23], which is quite low as compared to previous studies, 2 patients had minor bleeding from stoma edges and 1 patient had venous bleeding around foramen of Monro by traction injury of endoscope, in all patients bleeding stopped spontaneously with irrigation of Ringer's lactate [23, 24]. Present study also highlights 0.6% death rate during hospital stay on 3rd post-operative day after seizures and sudden deterioration. Many of the death cannot be directly linked with ETV procedure and other associated issues [27, 28]. From all the available options for the treatment and management of hydrocephalus, ventriculostomy appeared to be the most suitable option due to its less invasive nature with minimal risk of associated complications, morbidity and mortality with favorable outcome as compared to other available options like shunting as compared to ventriculostomy. Avoidance of multiple-trials, prediction of success rate and pre-operative planning could prove prerequisite for successful endoscopic third ventriculostomy [29-31].

CONCLUSIONS

Ventriculostomy appeared to be the better surgical approach for obstructive hydrocephalus management. Cerebrospinal fluid leakage appeared to be common complication of ventriculostomy followed by seizures, minor bleeding, meningitis and wound infection. Ventriculostomy can be recommended as procedure of choice in obstructive hydrocephalus in terms of early post-operative complications which are well tolerated by the patients.

Authors Contribution

Conceptualization: SP
Methodology: SP, VK
Formal analysis: HU, MHA, SAA
Writing-review and editing: HU, SAA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

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Original Article

Pattern of Mechanical Asphyxia Deaths in Forensic Autopsies at Medicolegal Section of Liaquat University Hospital, Hyderabad

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ABSTRACT

Asphyxia is characterized by oxygen deprivation in cells resulting from insufficient or altered oxygen supply. Mechanical asphyxia refers to inadequate breathing caused by external forces. This study assessed the pattern of mechanical asphyxia-related autopsies carried out at a medico-legal section of Liaquat University Hospital, Hyderabad. **Objective:** To assess the pattern of mechanical asphyxia-related autopsies carried out at a medico-legal section of a tertiary care teaching hospital. **Methods:** This prospective observational study was performed to analyze the forensic autopsy reports from January 2021 to December 2022 at Liaquat University Hospital. Hyderabad and 103 medico-legal cases of mechanical asphyxia were enrolled. All autopsy reports related to mechanical asphyxia were included. The data were collected on a predesigned pro forma. Autopsies of non-medicolegal nature and related to unnatural deaths apart from mechanical asphyxia were excluded. **Results:** Most of the cases (n=51) were identified as caused by the drowning. The hanging and strangulation occurred in an equal number of mechanical asphyxia-related autopsies (n=26 each). The male gender dominated the frequency of drowning and strangulation while hanging was more prevalent in females. **Conclusions:** Drowning was observed as the most prevalent mechanism of mechanical asphyxia in medico-legal autopsies conducted over a period of two years.

INTRODUCTION

Postmortem examination research of the corpse is crucial in determining the cause of death. In order to ascertain the cause of death, a medical professional will conduct an autopsy, which involves a thorough inspection of the body's internal and external organs and cavities [1]. Conducting a clinical autopsy with the goal of clinical investigation allows for the identification of the underlying cause of death and is a crucial tool for assessing healthcare quality [2]. On the other hand, the goal of a medi-colegal autopsy is to positively identify the corpse and determine the cause of death in relation to any possible criminal actions [1]. In order to gather data for population-level healthcare planning and use as evidence in court processes, both kinds of autopsy are essential. The autopsy can also provide light on whether the death was accidental, homicidal, or suicide-related [3]. There are many facets to medical practice, including dealing with legal issues. Claims for personal injuries, medical malpractice, criminal charges, and workers' compensation are only a few examples of the many situations in which legal matters could emerge [4]. The term "asphyxia" encompasses the state of cells lacking oxygen as well as any and all consequences of an insufficient or changed oxygen supply [5]. When the airways are blocked or compressed from the

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outside, a condition known as mechanical asphyxia develops. Drowning, hanging, or strangling are some of the ways this might occur [6]. Death occurs when the respiratory system is unable to take up enough oxygen and release enough carbon dioxide, a condition known as mechanical asphyxia [7]. Mechanical hypoxia typically results in mortality because critical organs, including the brain, do not receive enough oxygen [8]. The word "drowning" is used in forensic asphyxia to describe a person's demise due to submersion in water. Most of the time, water is used as the immersion liquid [8, 9]. When submerged in water, oxygen is less available for respiration. The terms "strangulation" and "hanging" describe the same thing: the application of external pressure with a lead bullet that seals up the airways or the blood vessels in the neck, which blocks the airways and causes death [7]. When looking into unexpected suspicious deaths, medi-colegal autopsies play an important and vital role. In order to make sense of regional mortality data attributed to non-natural causes, it is crucial to profile and appreciate the profile of cases that undergo medico-legal autopsy. Based on region-specific mortality rates, this information also helps in addressing demographic requirements. It is also crucial for studying local crime rates and avoiding needless fatalities in the future [10]. Legal and medical experts in Pakistan have documented instances of causes of death other than natural causes, such as gunshot wounds, but mechanical asphyxiation has gotten less research and attention[11].

Therefore, the current study aimed to report the two-year frequency of mechanical asphyxia deaths in the medico-legal department of Liaquat University Hospital Hyderabad.

METHODS

This two-year observational and prospective study analyzed forensic autopsy reports from the medico-legal section at Liaquat University Hospital, Hyderabad after approval ref no. LUMHS/FM/68/20 dated10-11-2020. The study included the autopsies related to mechanical asphyxia. The deaths due to mechanical asphyxia were categorized as drowning, hanging, and strangulation. Autopsies of non-medicolegal nature and related to unnatural deaths apart from mechanical asphyxia were excluded. A proforma was designed to collect data, including the cause of death. Proximate family members of the decedent gave their approval. Descriptive statistics were performed using IBM SPSS Statistics for Windows, version 24.0.

RESULTS

The predominant portion of the autopsies revealed drowning as the primary cause of death across both years under review. Notably, hanging and strangulation emerged as equally prevalent factors contributing to mechanical asphyxia, with each identified in 26 autopsies. Moreover, it is noteworthy that March exhibited the highest frequency of mechanical asphyxia-related autopsies, indicative of potential seasonal variations or heightened risk factors during that time period. Conversely, December recorded the lowest number of such cases, suggesting potential fluctuations in risk factors or external influences impacting mortality rates during this month. This comprehensive analysis underscores the significant burden of mechanical asphyxia-related fatalities within the studied population and highlights the need for targeted interventions and preventive measures to mitigate the associated risks and enhance public safety (Table 1).

Table 1: Month-Wise Frequency of Deaths due to Mechanical Asphyxia

Month	Drowning		Hanging		Strangulation		Total
	2021	2022	2021	2022	2021	2022	
January	0	1	3	2	3	1	10 (9.7%)
February	0	1	2	1	0	1	5 (4.85%)
March	6	0	3	0	2	2	13 (12.62%)
April	2	1	2	1	0	1	7 (6.79%)
May	2	2	1	3	1	0	9 (8.73%)
June	5	3	0	1	1	2	12 (11.65%)
July	5	2	1	1	0	1	10 (9.7%)
August	3	3	0	2	0	3	11 (10.67%)
September	2	6	0	1	3	0	12 (11.65%)
October	1	0	1	0	1	2	5 (4.85%)
November	3	2	0	0	1	1	7 (6.79%)
December	0	1	1	0	0	0	2 (1.94%)
Total	29	22	14	12	12	14	**103**

Figure 1 shows that out of all the cases of mechanical asphyxia-related autopsies, around half were caused by drowning. But half of the people who died from mechanical asphyxia were strangled or hanged. When looking at the gender breakdown of asphyxia-related fatalities, it was found that males had a far greater rate of drowning and strangling cases than females.

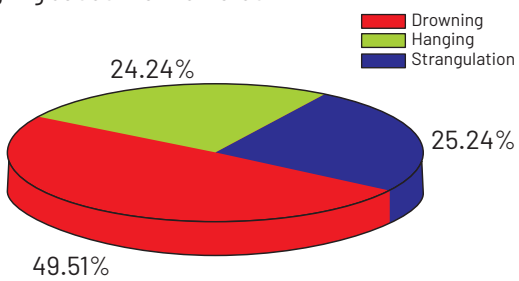

Figure 1: The Proportion of Drowning, Hanging, and Strangulation in Mechanical Asphyxia

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On the other hand, autopsy performed on males showed a lower frequency of hangings than on females, although the latter still had a considerable incidence (Figure 2). This gender-specific disparity in the manifestation of different modes of mechanical asphyxia underscores the importance of considering gender-sensitive approaches in designing preventive strategies and interventions aimed at reducing the incidence of such fatalities.

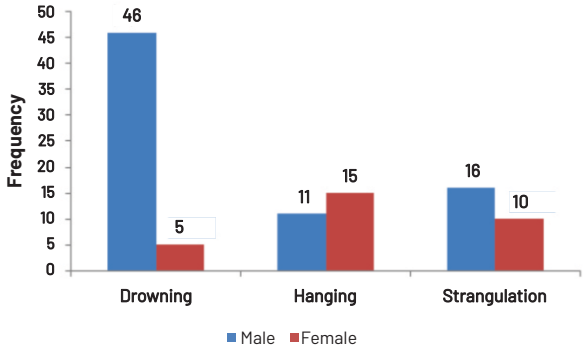

Figure 2: Gender Distribution across Different Causes of Mechanical Asphyxia

DISCUSSION

We found that asphyxial deaths were more common in males which is consistent with other studies from Pakistan [11,12], India [3], Germany [13] and Brazil [14].This may be accredited to certain factors such as the higher likelihood of males being the primary breadwinners and being exposed to accidents, violence, and stress. Additionally, males are more prone to addiction and risky behaviour [15]. The study also revealed that the asphyxial deaths occurred in adults, which is in line with previous studies. More adults died from suffocation than younger or older people, according to a three-year retrospective research [15] and a four-year prospective research [11]. One possible explanation is because adults are more likely to be involved in a wide range of activities, which leaves them more exposed to hazards [15]. This study found that drowning was the primary cause of fatality related to mechanical asphyxia. The act of strangulation or hanging was the second most common cause of death due to asphyxiation. There were ninety percent male participants who drowned. This finding is in line with global figures from the World Health Organization [16] and the Centers for Disease Control and Prevention drowning information page [17]. On the other hand, the present study looked at more girls being hanged than males. Other research have shown a larger frequency of hangings in autopsy for men compared to females [18, 19], however our result contradicts that. Additional research is needed to determine if these variations reflect regional disparities in hanging-caused asphyxia. In Azad Jammu and Kashmir, Mehmood et al., also found results that were comparable to those of the current study. In this study, there was an increased risk of fatal asphyxiation occurrences among men and young people (ages 19–49). According to forensic investigations, the leading cause of death from asphyxiation was drowning, although hanging was also a major factor in many cases. A study aimed at identifying the various forms of mechanical asphyxia found that hanging was the most common (61.91%), followed by drowning (33.33%) and strangulation (4.76%) in medico-legal autopsies [14]. In another study of 320 medico-legal autopsies, hanging was found as the mechanism of asphyxia in more than 75% of cases, while drowning and strangulation followed the frequency of hanging [21]. Nonetheless, strangling was shown to be the most prevalent mode of asphyxial fatalities in Peshawar, Pakistan, according to a four-year prospective analysis [11]. According to a study that looked back over 20 years of data on violent deaths, accidents, and suicides in Hamburg, Germany, the most common cause of asphyxia was drowning [22]. Similarly, drowning was ranked as the second most common cause of death in India, after only automobile accidents [23]. Another research in India found that drowning and hanging were the leading causes of asphyxial mortality as determined by postmortem results [24]. These findings suggest that patterns of asphyxial deaths may vary on a national and international scale.

CONCLUSIONS

Drowning was the leading cause of mechanical asphyxia-related deaths, followed by hanging and strangulation.

Authors Contribution

Conceptualization: NA
Methodology: NA, MIP
Formal analysis: IB
Writing-review and editing: MRS, AS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Infant Hearing Loss: Are Mothers Aware?

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ABSTRACT

If hearing impairment goes unnoticed, negative effects on the infant's communication, academic, learning, socio-emotional, and language skills occur. Mothers have an essential and significant role in screening and early intervention. Hence, the level of their knowledge and attitude needs to be addressed. **Objective:** To determine the maternal awareness towards infant hearing loss. **Methods:** This cross-sectional study was conducted at Isra University, Islamabad from February to July 2020. The study recruited a sample of n=377 pregnant women aged 18-45 years, utilizing convenience sampling. A basic demographic sheet and a Maternal Awareness about Hearing Loss questionnaire were used for data collection. Data were statistically analyzed using SPSS Version 26.0. ANOVA and independent sample t-test statistics were utilized to determine any significant difference in knowledge and attitude scores for demographic variables and $p< 0.05$ was considered significant. **Results:** Overall mothers responded positively to knowledge and attitude items with good scores for knowledge (25.71 ± 6.27) and attitude (8.01 ± 1.88). There was a significant ($p<0.05$) difference in knowledge and attitude scores for educational level, financial status, and employment status and age revealed significant difference for level of knowledge. **Conclusions:** This study concluded that maternal awareness about hearing loss is variably distributed for different risk factors and has a positive attitude about hearing loss and a highly positive attitude and willingness to accept the management options in case hearing loss is detected.

INTRODUCTION

Hearing impairment (HI) is a common disability and according to the World Health Organization (WHO), 6.1% of the total population of the world is suffering permanent hearing loss (HL) including 7% of children, with an estimated 900 million HL by 2050 [1]. Prevalence of permanent HL above 40 dB in neonates varies from 1-6/1000 (overall 2.21/1000) with higher prevalence in Asian countries and Neonatal Intensive Care Unit (NICU) population [2]. In Pakistan too, 1.6 per 100 have bilateral HL and 70% increase is due to consanguineous families [3]. HL affects children by causing a delay in receptive and expressive language development. Language delays may result in hurdles to achieving academic goals; it affects the ability of children to communicate causing feelings of depression, loneliness, frustration, and poor self-concept as well as affecting vocational choices [4]. Detection of HI under the age of 6 months positively affects language acquisition and lingual achievements [5]. According to Nasralla et al., when parents accept the HI of their child, this is the start of the communicational development of the child both verbal as well as gestures [6]. The establishment of the National Health Service (NHS) is extremely helpful in reducing the average age for identification of babies with permanent childhood hearing loss. The overall success depends on providing timely and effective diagnostic and intervention services [7]. It also depends on parental

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perception, educational level, and economic and social status and these factors could limit the timely screening and intervention. So, it is very important to assess the parental perspective towards screening [8]. The parents of neonates have a very important role in screening and early intervention. Their decisions mainly depend on the knowledge they have and their attitude. Their decisions toward the identification of HL and early intervention of HL may have lifelong effects on the infant's life [9]. The attitude of parents toward their children's HI depends on the knowledge and hopes they have for their child's growth which also depends on culture, and socio-societal values [10]. Infants who suffer from hearing loss need the right support, care, and early intervention services to promote healthy development. If hearing impairment goes unnoticed for many years, it may have negative effects on the infant's communication and language skills because most children pass the age of development of language. Thus, Parental awareness of infant HL is of significant importance for the implementation of Early Hearing Detection and Intervention (EHDI) programs to be done successfully [11]. Hence, keeping in view the high prevalence of HL [3], the importance of parental involvement in the identification and early intervention of HL [9], and the fact that parental attitudes toward their HI children depend on knowledge and hopes which might vary with culture and socio-societal values, this study was conducted. The objective of the study was to determine maternal awareness of infant hearing loss [3, 9].

The rationale behind this study was to explore the existing knowledge and information of mothers about childhood HL and about childhood HL which could eventually lead to early intervention and management of these children. The study highlighted the crucial role of mothers in the implementation of the early detection of childhood hearing loss. This study is very important since on the one hand, it highlight the knowledge and attitude of mothers in the implementation of early detection of childhood hearing loss and, on the other hand, provided policymakers valuable data to design future strategies for early detection and management of HI children.

METHODS

This cross-sectional study was conducted at Isra University, Islamabad over 6 months from 1st February to 31st July 2020. The study recruited a sample of n=377 pregnant women from the Gynecology outpatient department of Sir Ganga Ram Hospital, Lahore utilizing convenience sampling, after calculating a sample of n=377 participants using the Raosoft online calculator, at a confidence level of 95%, margin of error 5% and population of 2000. Inclusion Criteria: The sample included women of reproductive age including 18-45 years and who were pregnant in any trimester. Exclusion Criteria: Females who were not pregnant and below or above age 18-45 years were excluded from the study. A basic demographic sheet and standardized questionnaire for Maternal Awareness about hearing loss for pregnant women were used for data collection [12]. Maternal Awareness about Hearing Loss is a reliable tool to determine maternal awareness regarding hearing loss for pregnant women developed by Olusanya *et al.*, (12). The tool has high reliability of α=0.84 and 0.83 for the 2-mains. It consists of a total of 15 items, including in the first domain it has 12 items designed to ascertain a respondent's knowledge with a score range of 12 to 38, and in the second domain it has 3 items with a score range of 3 to 9 to measure the attitude toward early detection and intervention. For each item, the responses noted included 1 for "No" response, 2 for "Not sure" and 3 for "Yes" with a mean score of 2.5 and above considered high [12]. The study was conducted following ethical approval of research from the Advanced Study and Research Committee, Isra Institute of Rehabilitation Sciences (IIRS), Isra University, Islamabad, vide reference number F.I/IUIC-IIRS/ASRC-055/2020, and informed consent of participants. All ethical principles were followed and the confidentiality of participants was maintained. Data were collected by the researchers directly from the pregnant women who visited the hospital, using the questionnaire, and the questionnaires were filled by the researchers as per participant responses. Following data collection, it was statistically analyzed using SPSS Version 26.0. One-way ANOVA was used to determine statistically significant differences in knowledge and attitude for age, education, financial status and number of children, while independent sample t-test statistics were utilized to determine any significant difference in knowledge and attitude scores for demographic variables of employment status and any disability in facility $P< 0.05$ was considered significant.

RESULTS

The current cross-sectional study with a sample of n=377 comprised a population of 18-45 years with 225 (59.7%) being 25-31 years of age and 159 (42.2%) having secondary and university level education. Financial status of most 196 (52%) was middle level and majority 308 (81.7%) were unemployed with 226 (59.9%) having 1-2 children. The majority 338 (89.7%) had no disability in a family (Table 1).

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Table 1: Demographic Variables of the Participants

Variables	Group	n (%)
Age (Years)	18-24	86 (22.8)
	25-31	225 (59.7)
	32-38	56 (14.9)
	39-45	10 (2.7)
Educational level	No formal Education	37 (9.8)
	Primary	22 (5.8)
	Secondary	159 (42.2)
	University Level	159 (42.2)
Financial Status	Low	159 (42.2)
	Middle	196 (52)
	High	22 (5.8)
Employment Status	Yes	69 (18.3)
	No	308 (81.7)
No. of Children	Nil	93 (24.7)
	1-2	226 (59.9)
	3-4	40 (10.6)
	Above 4	18 (4.8)
Any Disability in the Family	Yes	39 (10.3)
	No	338 (89.7)

Most mothers responded positively to knowledge items with high mean scores except for items "Convulsions can cause HL" and "Native medicine can cause HL", for which most were unsure; "Jaundice can cause HL" and "Hearing impaired children can still hear and speak" for which most mothers responded negatively with low mean scores. For attitudes, most mothers responded positively with high mean scores for each item (Table 2).

Table 2: Descriptive Statistics of Maternal Knowledge and Attitude (n=377)

Group	Item	No n (%)	Unsure n (%)	Yes n (%)	Mean ± SD
Knowledge	Babies can be born with HL	36 (9.5)	74 (19.6)	267 (70.8)	2.61 ± 0.66
	High fever can cause HL	84 (22.3)	134 (35.5)	159 (42.2)	2.20 ± 0.78
	Measles can cause HL	101 (26.8)	128 (34)	148 (39.3)	2.12 ± 0.80
	Ear discharge can cause HL	78 (20.7)	103 (27.3)	196 (51)	2.31 ± 0.80
	Convulsions can cause HL	114 (30.2)	146 (38.7)	117 (31)	2.01 ± 0.78
	Drugs can cause HL	105 (27.9)	139 (36.9)	133 (35.3)	2.07 ± 0.79
	Native medicine can cause HL	126 (33.4)	153 (40.6)	98 (26)	1.93 ± 0.77
	Prolonged Noise can cause HL	103 (27.3)	125 (33.2)	149 (39.5)	2.12 ± 0.81
	Jaundice can cause HL	134 (35.5)	112 (29.7)	131 (34.7)	1.99 ± 0.84
	Delay in crying at bath can cause HL	59 (15.6)	77 (20.4)	241 (63.9)	2.48 ± 0.75
	Detection is possible soon after birth	43 (11.4)	79 (21)	255 (67.6)	2.56 ± 0.69
	Hearing impaired children can still hear and speak	312 (82.8)	15 (4)	50 (13.3)	1.31 ± 0.69
	Total	-	-	-	25.71 ± 6.27
Attitude	Would like baby tested after birth	36 (9.5)	3 (0.8)	338 (89.7)	2.80 ± 0.59
	Would use hearing aids	82 (21.8)	9 (2.4)	286 75.9)	2.54 ± 0.83
	Would use hearing aids if provided at no cost	48 (12.7)	29 (7.7)	300 (79.6)	2.67 ± 0.69
	Total	-	-	-	8.01 ± 1.88

Anova statistics (Table 3) show that knowledge mean scores of participants differ significantly (p=0.000) for different age groups with the highest scores (26.91 ± 6.27) for the 25-31 years age group, while attitudes scores did not reveal significant difference for different age groups (p=0.132). Knowledge and attitude scores revealed significant (p=0.000) differences for educational level with the highest scores for university level. Knowledge and attitude scores also revealed significant (p=0.000) differences in the Financial status of mothers with the highest scores for higher levels of status. There was no significant difference in knowledge and attitude scores for several children with p=0.292 and p=0.069 respectively. Knowledge and attitude scores revealed significantly higher scores for those who were employed with p=0.000 and p=0.012 respectively. There was no significant difference in knowledge and attitude scores for any disability in a family with p=0.427

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and p=0.063 respectively.

Table 3: Demographic Variables vs. Mean Scores of Maternal Knowledge and Attitude. Cross Tabulation (n=377)

Variable	Category	Group (n)	Mean ± SD	f/t	P
Age (Years)	Knowledge	18-24 (86)	23.02 ± 5.96	8.783	0.000
		25-31 (225)	26.91 ± 6.27		
		32-38 (56)	25.25 ± 5.46		
		39-45 (10)	24.30 ± 6.17		
	Attitude	18-24 (86)	7.92 ± 2.01	1.881	0.132
		25-31 (225)	8.16 ± 1.74		
		32-38 (56)	7.52 ± 2.14		
		39-45 (10)	8.20 ± 1.69		
Education	Knowledge	No Formal Education (37)	22.00 ± 6.32	22.745	0.000
		Primary (22)	23.41 ± 6.04		
		Secondary (159)	24.09 ± 5.76		
		University Level (159)	28.50 ± 5.65		
	Attitude	No Formal Education (37)	7.35 ± 2.19	9.689	0.000
		Primary (22)	6.45 ± 2.77		
		Secondary (159)	7.97 ± 1.91		
		University Level (159)	8.42 ± 1.41		
Financial Status	Knowledge	Low (159)	23.68 ± 5.84	21.592	0.000
		Middle (196)	26.73 ± 6.12		
		High (22)	31.23 ± 5.12		
	Attitude	Low (159)	7.63 ± 2.12	7.722	0.000
		Middle (196)	8.21 ± 1.70		
		High (22)	9.00 ± 0.00		
No of children	Knowledge	Nil (93)	26.13 ± 6.74	1.248	0.292
		1-2 (226)	25.86 ± 6.32		
		3-4 (40)	23.95 ± 5.12		
		>4 (18)	25.44 ± 5.12		
	Attitude	Nil (93)	7.81 ± 2.14	2.382	0.069
		1-2 (226)	8.15 ± 1.77		
		3-4 (40)	7.48 ± 1.89		
		>4 (18)	8.56 ± 1.29		
Employment Status	Knowledge	Yes (69)	29.19 ± 5.56	5.286	0.000
		No (308)	24.93 ± 6.16		
	Attitude	Yes (69)	8.52 ± 1.27	2.523	0.012
		No (308)	7.90 ± 1.97		
Any Disability in Family	Knowledge	Yes (39)	26.46 ± 6.092	0.795	0.427
		No (338)	5.62 ± 6.29		
	Attitude	Yes (39)	8.54 ± 1.47	1.863	0.063
		No (338)	7.95 ± 1.91		

DISCUSSION

The current study utilized a sample of N=377 mothers, aged 18-45 years and 42.2% having secondary and University level education each with 52% belonging to the middle class to determine the maternal awareness towards infant Hearing Loss (HL), since Parents have been reported to be more effective than professionals in the early diagnosis of a wide range of child health problems [13]. The study results showed that maternal awareness was good about prevailing risk factors that cause hearing loss in infants and excellent attitude towards infant hearing testing right after birth and fitting of hearing aids except for item "convulsions can cause HL" and for which most were unsure; "Jaundice can cause HL" and "Hearing impaired children can still hear and speak" for which most mothers responded negatively with low mean scores. For attitudes, most mothers responded positively with high mean scores for each item. Similarly, Al-Yahya *et al.*, in a Saudi Arabian study reported a high level of awareness of mothers about risk factors except for the impact of late crying of baby, jaundice after birth, high-grade temperature, and infections during

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pregnancy [14]. In slight disagreement, a study by Dudda *et al.*, reported great awareness of mothers for visible factors and for attitudes they were positive for early screening and follow-up for HI, however, knowledge was deficient for newborn jaundice, Neonatal Intensive Care Unit (NICU) stay, late occurring and neural HI, its management, fitting of hearing devices and need of rehab [15]. Jattoo *et al.*, revealed a low level of knowledge regarding screening of newborns for HI and risk factors of HI, however, they revealed acceptance of screening [16]. A low level of knowledge regarding newborn Hearing screening, though there is a will to accept screening among mothers [17]. A very positive maternal attitude towards early detection of hearing loss is a wake-up call to all related healthcare professionals. Technology has expanded the band of possibilities related to infant hearing screening. Parental denial when HL is diagnosed is a usual source of concern in early intervention [16]. However, it is appreciated that a majority of mothers showed a highly positive response regarding their infant's hearing test right after birth and readiness to use hearing aids for their children if needed. When the option of free hearing aid provision was given, only a minimal increase occurred. The current study showed that knowledge mean scores of participants differed significantly (p=0.000) for different age groups with the highest scores for the 25-31 years age group, while attitudes scores did not reveal significant differences for different age groups (p=0.132). Similarly, in another study age was the only factor associated with knowledge [18]. In the present study, Knowledge and attitude scores revealed significant (p=0.000) differences for educational level with the highest scores for university level. The study results documented that those participants who have secondary and tertiary level education revealed better knowledge about risk factors of HL and a positive attitude toward early detection of HL in their infants. In contrast, study by Jatto *et al.*, revealed no association with educational level [16]. Educational level did not have any association with awareness as well [17]. However, in a study by Yunis *et al.*, both mother and father's educational level seemed to predict childbirth morbidity with illiteracy in mothers contributing to a 3 to 5 times increase in NICU admission and longer hospital stay [19]. In the current study knowledge and attitude scores, also revealed significant (p=0.000) differences in the Financial status of mothers with the highest scores for higher socioeconomic status. Similarly, the literature reveals the acceptance of screening for HL is associated with the financial situation [16]. Willingness to accept NHS was associated with financial status [17]. In a similar analogy, in the present study Knowledge and attitude scores revealed significantly higher scores for those who were employed with p=0.000 and p=0.012 respectively. Present study results showed that maternal knowledge about the presence of hearing loss at the time of birth was good and lower level of maternal knowledge about HL due to high fever. The maternal knowledge for ear discharge, measles, prolonged noise, and jaundice scores was in decreasing order with maternal knowledge about ear discharge was more than other factors. An international study conducted recently in 2021 documented similar results. Postpartum mothers' knowledge was highest for measles and ear discharge but low for native medicine as well as on other causes of infant HL. The maternal attitude was generally very positive and the majority would accept hearing aid as an Infant Hearing Loss (IHL) intervention [20]. Another study revealed maternal awareness of measles, discharging ear, jaundice, native medicine, and birth asphyxia causing hearing loss in decreasing order of frequency; with very positive behavior towards National Health Service (NHS), and increased acceptance of Hearing Aids (HA) [18]. Discharging ear is a familiar childhood ailment for many mothers [21]. A questionnaire-based study by Kaspar *et al.*, in 2017 showed that parental responses were positive and higher readiness level towards their baby's hearing screening. The current study supports the results of this study [22]. The current study showed that maternal knowledge was good about prevailing risk factors causing HL and excellent attitude towards infant hearing testing after birth and fitting hearing aids if required. A cross-sectional study was conducted in 2018 in Saudi Arabia to assess maternal awareness about IHL. This study's results were consistent with the current study as maternal knowledge was good towards risk factors and great attitude for hearing testing of their babies rightly after birth [14].

CONCLUSIONS

This study concluded that maternal awareness about hearing loss is variably distributed for different risk factors and has a positive attitude about hearing loss and a highly positive attitude & willingness to accept the management options in case detected hearing loss.

Authors Contribution

Conceptualization: AA,
Methodology: MA, TD
Formal analysis: AA, NM, GS
Writing, review and editing: NM, AI, GS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Comparing the Impact of Workload on the Mental Health of House Officers at Public and Private Hospitals of Peshawar

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ABSTRACT

Healthcare environments place a high priority on the mental health of medical personnel, especially house officers. **Objective:** To compare the impact of workload on the mental health of house officers at public and private hospitals of Peshawar. **Methods:** Descriptive cross-sectional design was used to gather data from 164 house officers at four major hospitals in Peshawar, Pakistan (Khyber Teaching Hospital, Hayatabad Medical Complex, Kuwait Teaching Hospital, and Northwest General Hospital). In order to investigate the relationships between workload and mental health, data gathered from October 2023 to February 2024 via a standardized questionnaire on demographics, mental health, and workload was analyzed using descriptive statistics as well as inferential tests like chi-square and t-tests. **Results:** Out of 164 hospital patients, 29.7% had ages between 26 and 28. Among them 41.8% were female and 57.6% were male. Surgery (44.8%) and Medicine (54.5%) were the departments' representatives, while General Surgery (34.5%), Medicine (36.4%), Eye (15.2%), and ENT (13.3%) were the wards. The mean scores were (public: 30.69, private: 28.76; p-value.345), patient distribution (public: 11-40, private: 0-40; p-value 0.008), shift distribution (public: 0-15, private: 0-10), and self-reported concentration levels (p-value 0.051) showed significant differences between public and private hospitals. However, there was no discernible fluctuation in the strain levels (p-value = 0.658). **Conclusions:** House officers in Peshawar need special assistance from all sectors because of their tremendous responsibilities, particularly in public hospitals.

INTRODUCTION

The mental health of medical practitioners is critical in the field of healthcare. As students move from the academic environment to the real-world of patient care, house officers are an important group among these professionals [1, 2]. Given the possible effects on their mental health, the expectations made on house officers, especially in terms of workload, have drawn more attention [3, 4]. In the clinical context, house officers many of whom are recent medical graduates are given substantial responsibility [5]. They operate in a demanding and occasionally stressful workplace, juggling patient care, administrative duties, and ongoing education [6]. The long hours, heavy patient caseload, and lack of resources that characterize workload may be detrimental to house officers' mental health [7]. Numerous variables, like as sleep deprivation, emotional strain from patient interactions, and the difficulty to make critical decisions under time restrictions, all contribute to these professionals' overall stress levels [8]. Private as well as public hospitals are two separate categories within the healthcare system, with different patient demographics, organizational configurations, and financial allotments [9, 10]. Public hospitals, which typically service a larger population base and can be constrained by budgets and funds, may provide challenging working conditions and a heavy patient load for house officers [11]. On the other hand, private hospitals might offer better amenities and pay, but they may also face additional difficulties including meeting the needs of their clientele and meeting the

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standards of affluent patients [12]. Understanding how these varied work environments impact house officers' mental health is crucial for developing tailored therapies and support systems [13]. The purpose of this research is to provide light on the unique challenges and demands that employees in public and private hospitals face by contrasting their experiences. Additionally, by outlining potential areas for improvement in both fields, this kind of comparative research may ultimately improve the overall efficacy and wellbeing of the medical staff. Peshawar, the capital of Khyber Pakhtunkhwa province, is a microcosm of Pakistan's wider healthcare system. Numerous public and private hospitals with distinct organizational structures and specializations in patient care may be found there [14]. In an attempt to provide results that are culturally relevant and transferable to other regions of Pakistan coping with similar healthcare concerns, this research focused on Peshawar. The study's goal was to assess how house officers' mental health at Peshawar's hospitals, both public and private, was affected by their workload.

METHODS

The Khyber Teaching Hospital, Hayatabad Medical Complex, Kuwait Teaching Hospital, and Northwest General Hospital are the four main hospitals in Peshawar, Pakistan, where this study was carried out using a descriptive cross-sectional study design. The sample size of 164 house officers was determined using a proportional distribution method, allocating an equal portion from each of the four hospitals under investigation. However, it is essential to note that proportional distribution was solely used for sample size calculation and not as a sampling technique. The sampling technique employed adhered to the principles of non-probability purposive sampling, where house officers meeting the inclusion criteria and actively working at the chosen hospitals during the research period were selected. Those house officers on leave or who declined to take part in the survey were among the exclusion criteria. To gather information on participants' workloads and mental health indicators, an organized survey was created based on established measures and given to them. The questionnaire was divided into parts that evaluated mental health outcomes, workload variables, and demographic data. Over the course of five months, from October 2023 to February 2024, data was gathered. In order to guarantee thorough coverage of the experiences of house officers and workload differences throughout several seasons and clinical rotations, this period was chosen. A statistical software program was used to analyze the information gathered from the surveys. The features of the study population and workload factors were compiled using descriptive statistics, which included the computation of rates, proportions, means, and standard deviations. Workload variables and mental health outcomes were examined via the use of inferential statistics, such as t-tests and chi-square tests. P-values less than 0.05 were regarded as statistically meaningful. Ethical approval was obtained from the Ethical Review Committee of Prime Foundation Pakistan via ERC Approval Number: Prime/ERC/2024-71, dated: October 9, 2023. Prior to their participation in the study, every participant gave their informed permission, and safeguards were put in place to ensure the privacy of their data at all times throughout the investigation.

RESULTS

The demographic and departmental distribution statistics for a sample of 164 people in a hospital context are shown in Table 1. Age, gender, department, and wards are the four categories into which the data is divided. The data is broken down into two age categories in the age section: 23–25years and 26–28years. The frequency column shows how many people are in each age group: 115 people (69.7%) are between the ages of 23years and 25years and 49 people (29.7%) are between the ages of 26years and 28years. Data about the distribution of people by gender is provided in the gender section. There were two categories: Male and Female. There were 95 men (57.6%) and 69 women (41.8%) in each gender group, according to the frequency column. Data was shown in the department section according to the departments to which the persons belong. Medical and Surgery were the two departments that are mentioned. The number of people in each department is shown in the frequency column; there were 90 people in the medical department (54.5%) and 74 people in the surgery department (44.8%). In Table 1, Data on the distribution of patients across various wards, such as General Surgery, Medicine, Eye, and ENT (Ear, Nose, and Throat), is listed in the wards section. The number of patients in each ward is listed in the frequency column: 57 patients in General Surgery (34.5%), 60 patients in Medicine (36.4%), 25 patients in Eye (15.2%), and 22 patients in ENT (13.3%).

Table 1: Demographic Characteristics

Variables	Frequency (%)
Age (Years)	
23-25	115 (69.7)
26-28	49 (29.7)
Total	164 (100)
Gender	
Male	95 (57.6)
Female	69 (41.8)
Total	164 (100.0)
Departments	
Medical	90 (54.5)
Surgery	74 (44.8)
Total	164 (100)

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Wards	
General Surgery	57 (34.5)
Medicine	60 (36.4)
Eye	25 (15.2)
ENT	22 (13.3)
Total	164 (100)

The mean ratings of a particular variable are compared between public and private hospitals in Table 2. With a Mean Score of 30.6951, a Standard Deviation (SD) of 6.55591, and a Standard Error (SE) of the Mean of 0.72398, there are 82 observations in the public hospital category. The results of Levene's test for equality of variances show a Significant Difference (F) between the two groups' variances. There is a significant difference (Sig.= 0.345, t= 1.970, df = 162) in the mean scores according to the t-test for equality of means between public and private hospitals, indicating that the variable under discussion differs between the two hospital types.

Table 2: Comparison of Mean Scores between Public and Private Hospitals

Categories of Hospital	N	Mean ± SD	Std. Error Mean	Levene's Test for Equality of Variances		t-test for Equality of Means	
				F	Sig.	t	df
Public Hospital	82	30.69 ± 6.55	0.72	0.897	0.345	1.970	162
Private Hospital	82	28.76 ± 5.95	0.65				

Data on the distribution of patients across various daily criteria is shown in the "Patients per day" section (figure 1). Nine patients (11%) are in the 0–10 range, 32 patients (39%) are in the 11–20 range, 32 patients (39%) are in the 21–30 range, and 9 patients (11%) are in the 31–40 range at public hospitals. Of the patients in private hospitals, 49 (60%) fall into the 0–10 age group, 24 (29%) fall into the 11–20 age group, 5 (6%) fall into the 21–30 age group, and 4 (5%) fall into the 31–40 age group. There is a substantial variation in the patient distribution between public and private hospitals, as shown by the p-value of 0.008 in this section.

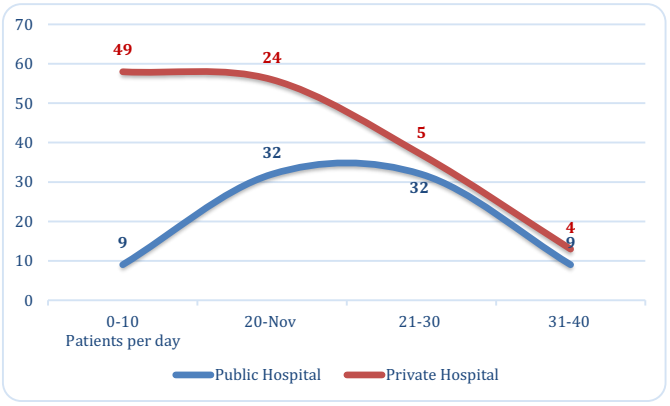

Figure 1: Comparative Patient Distribution Analysis: Public vs. Private Hospitals

Data on the distribution of shifts performed each month across various lengths is shown in the "Twenty-Four Hours Shift per Month" section. 52 shifts (63%) at public hospitals are in the 0–5 range, 27 shifts (33%) are in the 6–10 range, and 3 shifts (4%) are in the 11–15 range (Figure 2). There are 71 shifts (87%) in the 0–5 range, 11 shifts (13%) between 6–10, and no shifts in the 11–15 range at private hospitals. There is a significant variation in the shift distribution between public and private hospitals, as shown by the p-value of 0.032 for this section.

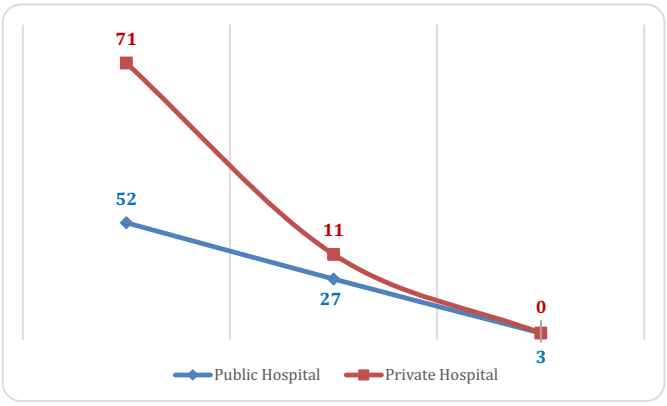

Figure 2: Comparative Analysis of Shift Distribution: Public vs. Private Hospitals

There is information about the self-reported capacity to focus under the "Been Able to Concentrate" section. In public hospitals, 8 people (10%) say they can focus more than usual, 17 people (21%) say they can concentrate the same as usual, 49 people (60%) say they can concentrate less than usual, and 8 people (10%) say they can concentrate considerably less than usual (figure 3). Thirteen (16%) say they can focus better than usual at private hospitals, thirty-five (43%) say it's the same as usual, thirty-four (42%) say it's less than usual, and not a single person (0%), say it's considerably less than usual. The p-value in this section is 0.051, indicating that there is a somewhat significant difference between public and private hospitals' self-reported concentration levels.

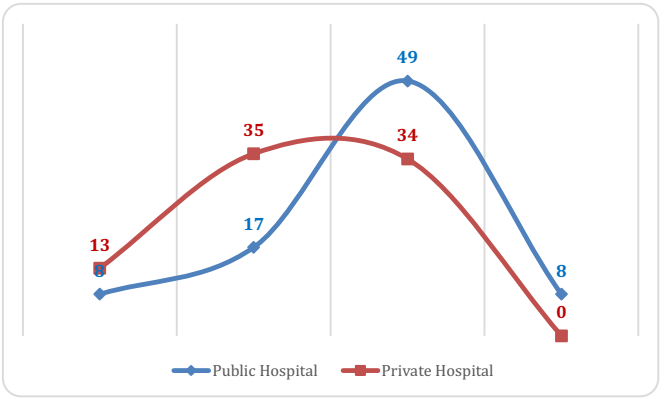

Figure 3: Comparative Analysis of Self-Reported Concentration Levels: Public vs. Private Hospitals Data on people's self-reported

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levels of strain are included in the "Constantly under Strain" section.

12 people (15%) in public hospitals say they are not at all straining, 33 people (40%) say they are not straining more than usual, 27 people (33%) say they are straining somewhat more than usual, and 10 people (12%) say they are straining as usual (Figure 4).

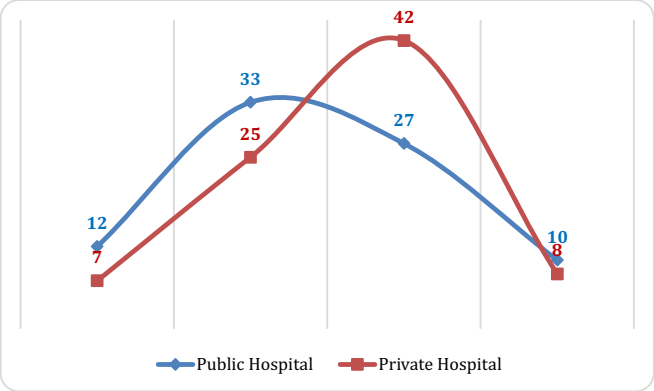

Figure 4: Comparative Analysis of Self-Reported Strain Levels: Public vs. Private Hospitals

In private hospitals, 7 people (9%) say they are not at all straining, 25 people (30%) say they are not straining more than usual, 42 people (51%) say they are straining more than usual, and 8 people (10%) say they are straining normal. The reported levels of strain at public and private hospitals do not significantly vary, as shown by the p-value of 0.658 for this area.

Table 3: Comparative Analysis of Healthcare Statements between Public and Private Hospitals

Statements		Public Hospital	Private Hospital	p-value
Patients per day	0-10	9	49	0.008
	11-20	32	24	
	21-30	32	5	
	31-40	9	4	
Twenty-Four Hours Shift per Month	0-5 days	52	71	0.032
	6-10 days	27	11	
	11-15 days	3	0	
Been Able to Concentrate	Better than usual	8	13	0.051
	Same as usual	17	35	
	Less than usual	49	31	
	Much less than usual	8	0	
Constantly Under Strain	Not at all	12	7	0.658
	No more than usual	33	25	
	Rather more than usual	27	42	
	Usual	10	8	

DISCUSSION

The study's departmental distribution and demographic data are consistent with other results from studies conducted in healthcare settings. In the age range of 23 to 25, 115 people (69.7%) and 49 people (29.7%) respectively were in the 26 to 28 age range. This distribution reflects similar age demographics seen in the study of Griffiths *et al.*, indicating a general trend in the healthcare workforce [15]. Our results showed that 90 persons (54.5%) belonged to the Medical department and 74 individuals (44.8%) belonged to the Surgery department. According to study by Chen *et al.*, and Wang *et al.*, these findings are in line with the dominance of the medical and surgical departments, which highlight the typical organizational structure of healthcare facilities [16, 17]. Our data shows that there were 57 individuals (34.5%) employed in general surgery, 60 individuals (36.4%) in medicine, 25 individuals (15.2%) in eye care, and 22 individuals (13.3%) in ENT. These percentages are in line with the distribution seen in Schweitzer *et al.*, in 2004 study, which highlights the prevalence of patient's in general medical and surgical wards as well as specialty wards for specific medical conditions [18]. The comparison of mean scores between public and private hospitals provides insight into the variations in a given attribute based on the kind of healthcare setting. The average score for the public hospital category is 30.6951, with a standard deviation of 6.55591 and a standard error of the mean of 0.72398. These findings are consistent with studies by Zhang *et al.*, and Li *et al.*, on the distribution and variability of clinical markers in hospital settings [19, 20]. The t-test for equality of means also shows an important distinction in mean scores between private and public organizations (Sig. = 0.345, t = 1.970, df = 162). This finding aligns with previous research conducted by Chen *et al.*, and Wang *et al.*, which demonstrated variations in healthcare practices and results across different types of healthcare establishments [16, 17]. This suggests those different public and private institutions' differences in patient demographics, treatment approaches, and resource distribution may be partially responsible for the observed heterogeneity in the variable under investigation. The daily patient distribution in public and private hospitals, as shown in this study, is in line with previous research on patient flow in healthcare settings. In public hospitals, the 0–10 range comprises 9 patients (11%) while the 11–20, 21–30, and 31–40 ranges include 32 patients (39%) and 9 patients (11%) respectively of the patients in private hospitals, 49 (60%) are between the ages of 0 and 10, 24 (29%) are between the ages of 11 and 20, 5 (6%) are between the ages of 21 and 30, and 4 (5%) are between the ages of 31 and 40. The differences between public and private hospitals that have been noticed might be related to variables that affect patient distribution patterns, such as hospital size, patient demographics, and service offers. These ratios align with findings from Johnson et al study, which found similar trends in the distribution of patients over different daily thresholds [21]. The section "Twenty-Four Hours Shift per Month" shows how shifts are worked

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each month and offers information on workload distribution and staffing trends in both public and private institutions. In public hospitals, 52 shifts (63%) fall between 0 and 5, 27 shifts (33%) fall between 6 and 10, and 3 shifts (4%) fall between 11 and 15. At private hospitals, there are 71 shifts (87%) between 0 and 5, 11 shifts (13%) between 6 and 10, and no shifts between 11 and 15. These results are consistent with research by Smith *et al.*, which found differences in shift distribution across various kinds of healthcare institutions [22]. The significance of staffing concerns and workload management methods in healthcare organizations is shown by the p-value of 0.032, which indicates a significant difference in shift allocation between public and private hospitals. As shown in the "Been Able to Concentrate" section, the self-reported capacity to concentrate is a crucial component of the mental health and work performance of healthcare professionals. In public hospitals, 8 people (10%) say they can focus more than usual, 17 people (21%) say they can concentrate the same as usual, 49 people (60%) say they can concentrate less than usual and 8 people (10%) say they can concentrate considerably less than usual. Thirteen (16%) say they can focus better than usual at private hospitals, thirty-five (43%) say it's the same as usual, thirty-four (42%) say it's less than usual, and not a single person (0%), say it's considerably less than usual. Further research is necessary to confirm this discovery, even if the p-value of 0.051 indicates a marginally significant difference in concentration levels between public and private institutions. The influence of work environment elements, including workload, job satisfaction, and organizational culture, on healthcare workers' capacity to focus has been addressed in studies by Lee *et al.*, and Patel *et al* [23, 24]. The section on people's self-reported levels of stress offers information on the mental health of medical staff members working in both public and private hospitals. 12 people (15%) in public hospitals say they are not at all straining, 33 people (40%) say they are not straining more than usual, 27 people (33%) say they are straining somewhat more than usual, and 10 people (12%) say they are straining as usual. In private hospitals, 7 people (9%) say they are not at all straining, 25 people (30%) say they are not straining more than usual, 42 people (51%) say they are straining more than usual, and 8 people (10%) say they are straining normal. The reported levels of strain across the two kinds of hospitals did not vary significantly, as shown by the p-value of 0.658. This is in contrast to studies conducted in different organizational contexts by Wang *et al.*, and Li *et al.*, that identified differences in stress levels among healthcare professionals [17, 20]. This disparity highlights how difficult it is to quantify psychological strain in healthcare environments and might be caused by a variety of factors, such as sample size, cultural variations, and methodological variations among studies.

CONCLUSIONS

When examining the impact of workload on house officers' mental health, Peshawar's public and private hospitals differ slightly from one another. While similar challenges, such a heavy patient load and demanding work schedules, exist in both public and private healthcare settings, there are certain pressures that are unique to each. House officers may be less focused and more anxious in public hospitals due to longer hours and higher patient numbers. Still, while having comparatively smaller patient caseloads, private hospitals still have the burden of meeting the expectations of affluent patients. These findings emphasize the need of specific support networks and therapeutic approaches to address the mental health of house officers in both public and private healthcare environments, increasing the flexibility and effectiveness of the medical community in Peshawar and beyond.

Authors Contribution

Conceptualization: AZ
Methodology: ZA
Formal analysis: FK, RI, FZ
Writing, review and editing: MS, HI, AZ

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Seasonal Decomposition of Sexual Victimization-Related Cases in Hyderabad, Pakistan

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ABSTRACT

The issue of sexual assault is a serious concern that contributes to abuses of human rights and risks to public health. Evaluating situations like these is absolutely necessary in order to make the judicial process easier for both the victim and the person who committed the crime. When the seasonality of sexual assault-related incidents is determined, it can provide the community and law enforcement authorities with information that can help them implement preventative measures. **Objective:** To assess the seasonality of sexual assault-related cases at casualty department of a teaching hospital in Hyderabad, Pakistan. **Methods:** In current descriptive/prospective study, ninety two sexual assault-related medico-legal cases (MLCs) were included. This study based on the seasonality of sexual assault-related MLCs using seasonal decomposition of three-year from January 2020 to December 2022 data from a leading tertiary care teaching hospital in the Hyderabad region. **Results:** Most of the cases (N=42) were reported in the year 2021. The percentage of sexual assault-related MLCs was found to be concentrated from June to August (10.86% to 14.13%). The highest number of sexual assault-related MLCs occurred in July. The seasonal decomposition also showed pronounced peaks in summer, with intense peaks in July for rape and total sexual assault cases. **Conclusions:** The number of sexual assault-related cases was aggregated in mid-year, showing a higher trend in summer season. Efficient preventive measures in certain seasons and education of vulnerable groups can minimize sexual violence in the community.

INTRODUCTION

Medical practice involves various aspects of human activities. Among them, one important part is related to questions of legal matters. The situations related to legal issues arise in multiple contexts including personal injury claims, medical malpractice lawsuits, criminal cases, and workers' compensation claims [1]. Sexual abuse represents a public health and human right problem that is growing in cultures of silence [2]. The reporting of sexual assault and related medico-legal cases (MLCs) is influenced by the norms and socio-cultural taboos of Pakistan [3]. The medical examination of sexual violence-related crime incidence is crucial in facilitating the justice system for the victim and offender. Most forms of criminal activity are generally observed to display seasonal variations, although these patterns may vary among different types of crimes. Seasonality refers to a recurring cyclical trend that occurs at consistent intervals. The study of seasonality and temporal trends in crime a date back to the mid-19th century and remains a topic of research today [4]. Assessing the seasonal variations in crime patterns has theoretical and policy implications. Different seasons have been reported to be associated with different kinds of crime [5]. The study of the seasonality of crime can help identify the periodicity of crimes and the underlying factors

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behind various crimes. Moreover, it can also be utilized in forecasting the volume of crimes to reach an informed decision for taking offence preventive measures and activities required in each season [6]. Studies have shown seasonal fluctuations in sexual violence-related cases [7, 8]. It has also been reported that seasonal patterns of crime can be different between various regions and even between different parts of one country [6, 9]. The nature and frequency of MLCs can vary from region to region, possibly affected by different cultures and seasonal variations [10, 11]. However, the seasonality of sexual assault-related MLCs has not been widely reported in Pakistan.

In the present study, the seasonal decomposition was performed on sexual assault-related MLCs that were conducted in the medicolegal department of Liaquat University Hospital, Hyderabad from 2020 to 2022. The time series analysis method was adopted for seasonal decomposition.

METHODS

This study based on the seasonal trend of sexual assault-related MLCs in Hyderabad region of Pakistan, the relevant data were collected from the casualty department of Liaquat University Hospital, Hyderabad after getting ethical approval from the Institutional Review Board vide letter # LUMHS/FM/44/20, dated: 17-09-2020. The casualty data included the cases that were identified as rape- and sodomy-related cases from January 2020 to December 2022. After arrival of cases of sexual victimization to casualty department, a thorough initial assessment of cases was performed to determine extent of the injury and identify any life-threatening conditions. This involved assessment of vital signs, airway, breathing, and circulation. Any fractures, soft tissue injuries, and other traumatic injuries were provided with treatment for clinical care. In case of unstable or life-threatening conditions, immediate interventions were initiated in order to stabilize the patient, such as controlling bleeding, ensuring adequate oxygenation and ventilation, and addressing any serious injuries. Following prompt trauma care, the subsequent steps included the plan to prioritize addressing sexually transmitted infections, pregnancy concerns, and psychosocial issues. Empiric treatment for sexually transmitted infections was provided, including, ceftriaxone 500 mg IM injection plus azithromycin 1 g PO (single dose) or metronidazole or tinidazole 2 g PO (single dose). Postcoital emergency contraception was offered to female victims without regard to their menstrual cycle. All subjects were excluded if their nature was judged to be non-sexual violence-related. The data were collected and analyzed using MS EXCEL. Seasonal decomposition was performed using Statgraphics Centurion XIX software. The data e presented as frequencies and their mean ± SD. The seasonal trend and time series analysis were conducted using seasonal decomposition and were presented as plots.

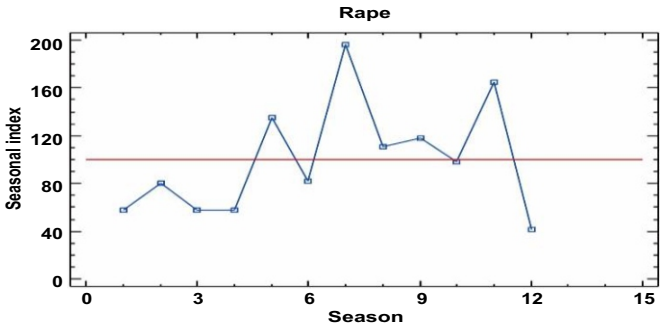
RESULTS

Most of the cases (N=42) were reported in year 2021. The percentage of total sexual assault-related cases occurring in different months of the year shows that a substantial percentage of such cases were aggregated in mid-year, i.e., June, July, and August (10.86% to 14.13%). The highest numbers of sexual assault-related MLCs were performed in July (Table 1).

Table 1: Month-Wise Frequency of Sexual Assault-Related MLCs for Three Years

Month	Year			Mean ± SD	Total
	2020	2021	2022		
January	1	1	4	2 ± 1.41	6 (6.52%)
February	2	3	1	2 ± 0.81	6 (6.52%)
March	1	1	2	1 ± 0.47	4 (4.34%)
April	1	4	3	2 ± 1.24	8 (8.69%)
May	0	4	2	2 ± 1.63	6 (6.52%)
June	1	6	4	3 ± 2.05	11 (11.95%)
July	3	6	4	4 ± 1.24	13 (14.13%)
August	2	6	2	3 ± 1.88	10 (10.86%)
September	3	1	1	1 ± 0.94	5 (5.43%)
October	1	5	3	3 ± 1.63	9 (9.78%)
November	3	4	3	3 ± 0.47	10 (10.86%)
December	1	1	2	1 ± 0.47	4 (4.34%)
Total	19	42	31	42 ± 31	92

The trend of sexual assault-related MLCs that can be interpreted from data in Table 1 was also reflected by seasonal index plots of rape, sodomy, and total sexual-assault MLCs. As depicted in Figure 1, the sexual assault-related MLCs peaked in the third quarter of the year compared to other months. The seasonal time plot (Fig. 1) also shows that the incidence of rape assault peaks in July, consistent with data in Table 1. The seasonal plot of sodomy indicates a high frequency of sodomy in May; however, this is again followed by a higher peak in July.



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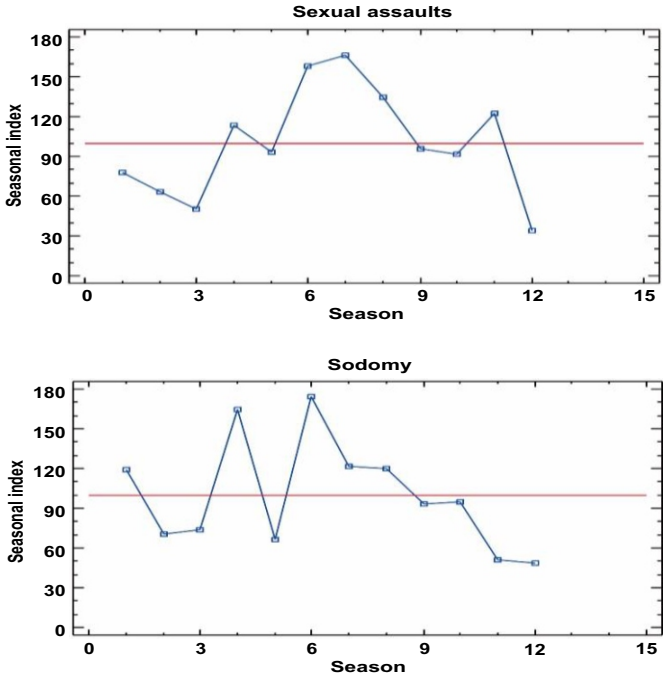
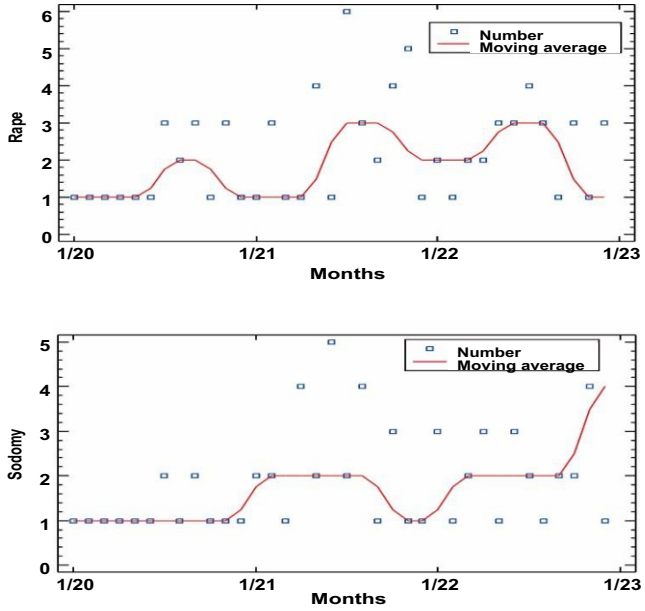


Figure 1: Seasonal Index Plots for Rape, Sodomy, and Total Sexual Assault-Related MLCs

Smoothed time series plots of rape, sodomy, and total sexual assault-related MLCs are presented in Figure 2. The smoothed time series plot of sexual assault-related MLCs shows three peaks at the start of the second half of each of the three years. The graph for rape-related MLCs shows a similar trend to total sexual assault-related MLCs. However, the trend of sodomy varies slightly in comparison to rape and total sexual assault-related MLCs. This suggests that rape might dominate the seasonal trend of sexual assault-related MLCs. On the other hand, sodomy might present an additional peak of the seasonal trend with reference to the trend of rape-related assaults.



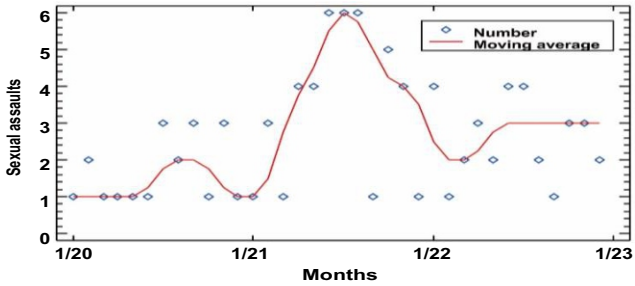


Figure 2: Smoothed Time Series Plot for Rape, Sodomy, and Total Sexual Assault-Related MLCs

DISCUSSION

Any society that upholds the principles of the rule of law and justice considers sexual violence a criminal act. Many types of crimes are periodic as they exhibit seasonal fluctuations in their volume. Often referred to as crime seasonality, this tendency can be captured in the form of time-series data with a recurring cycle [6]. The present study showed the seasonal fluctuation of sexual violence-related MLCs in the Hyderabad region of Pakistan. The data revealed that July, the hottest month in the region in terms of climatic temperature, presented the highest peaks of sexual assault-related MLCs in the region. This is different than a study from mid-Atlantic region of the United States, which observed the least cases of sexual assault reported to the emergency department in July [7]. An eight-year study in Tunisia reported spring as the most vulnerable season for sexual assault, followed by summer [2]. The findings of the present study are similar to some studies from other regions. Summer was found to be a vulnerable season for sexual assault in Qalyubia, Egypt, with more than 50% of 5544 sexual assaults occurring in the summer season [8]. A study from South Korea regarding the experiences of female sexual assault centres in the Incheon metropolitan city found July and August as relatively vulnerable months for sexual assaults [12]. Another study from a different town in South Korea also reported summer as the relatively vulnerable season for sexual assaults [13]. The highest trend of sexual assaults in summer was also found in three Regions of the Republic of Bulgaria [14]. In an Indian tertiary care hospital, the appraisal of sexual offence cases showed the occurrence of most cases during summer season [15]. It has been reported that the same type of crime can exhibit varying seasonal patterns between different countries and regions [9]. Regional differences can occur even within the same nation [6]. Alam et al., observed a major frequency of sexual assaults in Peshawar, Pakistan, occurring in winter in contrast to the present study's findings [16]. However, the number of sexual assault-related MLCs and assessment of their frequencies with reference to seasons has not been reported widely in Pakistan, suggesting the need for more studies. The peaks in violent crimes have

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been observed usually in relation to the summer season [17]. This may be ascribed to a reduction in people's mental capacity during warm weather, leading to making of irrational decisions [6]. One of the earliest discoveries in the field of criminology focused on the connection between warm weather and violent behavior. In 18th century, studies were conducted that identified a significant link between high temperatures and crimes against individuals. Researchers also named even named this phenomenon "the thermic law of delinquency" due to its consistent nature. Over the nearly two centuries since then, this foundational correlation has been extensively examined, questioned, and nuanced through a wide range of research studies [18]. Regarding the influence of weather, it has been stated that incidents of property crimes tended to be higher during winter compared to summer. Conversely, crimes against individuals appeared to be more common in summer, attributed to the warmer temperatures and heightened human emotions, while sexual offenses peaked in spring, a season associated with breeding [5]. Similar to the present study, a plenty of research conducted previously has generally identified peaks in summer for overall offenses like property crimes, violent crimes, and sex crimes [4]. A study in seven major US cities, demonstrated that every 5°C increase in daily mean temperature was associated with a 4.5% rise in sex offenses within the following 0–8 days. These associations were more pronounced during hot and cold seasons compared to moderate seasons and could be amplified by higher relative humidity and precipitation. The links were statistically significant for sodomy, fondling, and rape, particularly in specific locations such as open spaces, educational institutions, and streets rather than residences [19]. A cross-over study across Japan reported a nearly linear increase in the relative risk for self-harm and assault behavior as the temperature rose [20]. Likewise, it has been widely found that violent incidents exhibit a seasonal pattern, with the majority occurring during the summer or hotter seasons rather than in winter [17]. Consequently, interpersonal violence during warm weather is expected to persist and probably escalate in the future with temperatures rise as a result of climatic change. For instance, a study in US estimated estimate that 2.6% of sex offenses can be attributed to temperatures exceeding city-specific median temperatures, equating to an average annual sex offense rate of 2.9 per 100,000 individuals. These results highlighted the potential increase in sexual crimes associated with climate change, offering valuable insights for targeted prevention efforts [19, 20]. Another possible reason is the relationship between temperature climates and the activities of people. People tend to spend their time outside in summer compared to other seasons, making them more vulnerable by staying in a non-protected environment. Moreover, the school-going children remain on holidays and stay out of school during July and August. Consequently, comparatively increasing people's movement out of the relatively protected environment may result in periodic peaks in sexual assaults and other offences [5]. The strategies to prevent violent and sexual crimes linked to hot weathers are yet unclear. One proposed solution is the implementation of heat-warning systems to notify law enforcement agencies about high temperatures and the potential increase in violence. Help lines and public security awareness programs can also play a significant role. However, the effectiveness of these approaches would require assessment in future research studies. Furthermore, more well-designed studies are required to further explore the seasonal decomposition of sexual assault-related MLCs in Pakistan.

CONCLUSIONS

The seasonal fluctuations in sexual assault-related MLCs were assessed in the present study. The results showed the presence of seasonal changes in sexual assault-related MLCs. Smoothed time series and seasonal indices revealed a trend of peaks in sexual assault-related MLCs in summer, with July being the most vulnerable month.

Authors Contribution

Conceptualization: AR
Methodology: AR, UM, NA, AS, MRS, IB
Formal analysis: UM, NA
Writing-review and editing: AR, ASM, MRS, IB

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Comparison of Air Puff Tonometer with Gold Standard Applanation Tonometer for Measurement of Intraocular Pressure in Adult Population

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ABSTRACT

Detecting and treating glaucoma early is vital to prevent vision loss. Two main instruments, the Air Puff Tonometer and the Gold Standard Applanation Tonometer, are used to measure Intraocular Pressure (IOP). However, there is ongoing debate among ophthalmologists regarding the accuracy and reliability of these devices. **Objective:** To evaluate and contrast the measurements of intraocular pressure obtained through Air puff tonometry and Goldmann applanation tonometry. **Methods:** A cross-sectional comparative study was conducted upon 900 patients of Glaucoma, selected through purposive sampling technique, attending the Eye OPD of Isra University Hospital, Hyderabad. Patients with age more than 18 years, of both genders who provided consent for eye examination and treatment, were included in the study while patients with corneal disease or prior surgery, ocular trauma, or those presenting with active infection or ocular disease were excluded from the study. **Results:** 396 (44.0%) of patients were males and 504 (56.0%) were females. The results indicate that the mean IOP measurement for air puff tonometry (17.43 mm Hg) is significantly higher (p-value=0.0001) than the mean measurement obtained by Goldman tonometry (13.84 mm Hg). Overall, the distribution of IOP was similar for both types of tonometry, with a slightly higher proportion having high IOP values (19-22 mmHg) with Goldman tonometry compared to air puff tonometry. **Conclusions:** The findings of this research demonstrated a noteworthy contrast between the two techniques, where the air puff tonometry produced noticeably elevated intraocular pressure measurements in comparison to the widely accepted applanation tonometry.

INTRODUCTION

One of the major controllable and irrevocable cause of blindness in world is Glaucoma [1-3]. It is a multifactorial and chronic advanced optic neuropathy which is depict by impairment to Retinal Nerve Fiber Layer (RNFL) and optic disc, which results in complete and irreversible Visual Field (VF) loss [2-4]. About 3.5 % of worldwide population between the ages of 40 to 80 are estimated to have any sort of glaucoma [5]. The projection was that around 76 million individuals would be pretentious by glaucoma by 2020, and this figure is anticipated to escalation to 111.8 million by the conclusion of 2040 [6]. The common risk factors of glaucoma are age (older), race, family history, myopia, diabetes mellitus, hypertension and smoking [7, 8]. Glaucoma can also fall into the categories of angle closure or open angle glaucoma [9-11]. The most prevalent form of glaucoma globally is Primary Open Angle Glaucoma (PAOG) [12]. The typical pressure inside the eye, known as Intraocular Pressure (IOP), ranges between 10 to 21 mm Hg, and the average IOP is 16 mm Hg [13]. There are two theories regarding the pathogenesis of glaucoma. One is mechanical theory and other is Ischemic theory [14]. IOP plays important role in both theories. In mechanical theory, raised IOP results in disturbing of axoplasmic transport in the nerve fiber due to compression and this leads to loss of retinal ganglion cells [15]. While the ischemic theory states that raised IOP causes compression of blood vasculature leading to inefficient blood supply to optic nerve and ultimately leading to blindness [16, 17]. Different methods

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has been tried and used for IOP measurement but there is no yet perfect instrument [18]. Tonometry is done to measure the pressure of fluid inside the eye i.e. IOP [19]. Different types of method can be used to check the IOP such as Schiotz Tonometer, Goldman Applanation tonometer, Air-puff tonometer, Tono pen, Perkins tonometer, Dynamic contour tonometer etc. [20, 21]. The Goldman Application Tonometer (GAT) is a globally recognized tonometer that is utilized for measuring Intraocular Pressure (IOP). It comprises of a dual prism and is attached to a slit lamp apparatus [19-22]. The fundamental concept behind GAT is the Imbert-Fick law. This law stipulates that the pressure per unit area inside the eye, when a sphere is flattened, must match the pressure per unit area applied to flatten the sphere [22]. Air Puff (AP) tonometer is also build on principle of Application, where jet of air flattens the central cornea and IOP is measured. It is has got edge over GAT as that they are non-invasive/non-contact and there is no risk of infection [23]. As both instruments, the Air Puff Tonometer and the Gold Standard Applanation Tonometer, are used to measure Intraocular Pressure (IOP), but there is ongoing debate among ophthalmologists regarding the accuracy and reliability of these devices.

Therefore, this study was aimed to evaluate and contrast the measurements of intraocular pressure obtained through Air puff tonometry and Goldmann applanation tonometry.

METHODS

The cross-sectional comparative study was conducted at the Department of Ophthalmology at Isra University Hospital. Over a period of six months following approval of the study protocol, a sample size of 900 patients was calculated using the Formula n=N/ 1+ N (e) ^{2}, considering a margin of error (e) as 5%. This sample size was attained by assuming that frequency of five patients per day over the course of 180 days, resulting in a cumulative total of 900 patients. Patients were divided into 2 groups; Group A (N=450) whose IOP was measured by Goldman Applanation Tonometer and Group B whose (N=450) IOP was measured by Air Puff Tonometer. Adult patients of age more than 18 years and of both genders who provided consent for eye examination and treatment, were included in the study via purposive sampling technique while patients with corneal disease or prior surgery, ocular trauma, or those presenting with active infection or ocular disease were excluded from the study. Ethical approval was obtained from Ethical Review Committee of Isra University Hospital vide Letter No: IUH/ASST-DEAN (CS)/27/04/31 dated: 28/04/2022. The study was conducted from June 2022 to December 2022. Data collection involved measuring IOP using both Goldman Applanation Tonometer (GAT) and Air Puff Tonometer (AP) in all patients, with noting of any differences present. For GAT, eyes were anesthetized using Alcaine® 0.5% eye drops and a fluorescein strip applied to the conjunctival fornix. Goldman Applanation Tonometer operates on the Imbert-Fick principle, whereby pressure within the eye is determined by the force required to flatten its surface. The patient's head was positioned correctly, and the slit lamp was adjusted. The tonometer probe was aligned with the central cornea, and a controlled force was applied to applanate a small area of the cornea, flattening it slightly. The force required to achieve applanation, which correlated with the intraocular pressure, was determined by observing the mires through the microscope. Conversely, Air Puff Tonometer utilizes a brief surge of airflow to flatten the cornea, with intraocular pressure estimated by assessing the strength of the air burst. The instrument was used by directing a controlled puff of air at the cornea, causing momentary deformation. The device measured this deformation, estimating intraocular pressure. Data analysis was conducted using SPSS version 26.0, with categorical variables such as gender and IOP presented as numbers and percentages, and quantitative variables analyzed using independent sample t-test to compare measurements obtained by GAT and AP. P-value < 0.05 was considered statistically significant.

RESULTS

This study included 900 patients. Among 900 patients, 396 (44.0%) were males and 504 (56.0%) were females. The mean age of the population is 35.39 $\pm$ 12.25 years which suggests that there is a significant amount of variability in the ages of the population (Table 1)

Table 1: Descriptive Statistics of Participants (N = 900)

Variables	Frequency (%)
Gender	
Females	504 (56%)
Males	396 (44%)
Age (Years)	
Mean $\pm$ SD	35.39 $\pm$ 12.25
Minimum	18
Maximum	80
Range	18-80

The results indicate that the mean IOP measurement for air puff tonometry (17.43 mm Hg) is significantly higher (p-value=0.0001) than the mean measurement obtained by Goldman tonometry (13.84 mm Hg) in a Group A. Additionally, the standard deviation of the IOP measurements obtained by both methods is similar, indicating that the difference in mean IOP measurement is not simply due to variation in the data. The minimum and maximum IOP measurements for air puff and Goldman

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tonometry were also recorded, with air puff having a wider range (12-22 mm Hg) compared to Goldman tonometry (10-21 mm Hg). In general, these findings indicate a notable distinction in IOP evaluations acquired through air puff and Goldman tonometry techniques, with air puff tonometry consistently yielding higher readings within this particular sample (Table 2).

Table 2: Mean Value of IOP by Air Puff and Goldman Application Tonometer

IOP (Mm/Hg) Measurements	Groups		p-value
	Group A GAT (N = 450)	Group B AP (N = 450)	
Mean ± SD	13.84 ± 2.29	17.43 ± 2.3	0.0001
Minimum	10.0	12.0	
Maximum	21.0	22.0	
Range	10-21	12-22	

The table 3 shows the distribution of intraocular pressure (IOP) in two categories, measured using Goldman tonometry and air puff tonometry. For Goldman tonometry, 8.22% (37) of participants had an IOP of 7-10 mmHg, 27.33% (123) had an IOP of 11-14 mmHg, 35.62% (160) had an IOP of 15-18 mmHg, and 28.88% (130) had an IOP of 19-22 mmHg. For air puff tonometry, 1.37% (6) of participants had an IOP of 7-10 mmHg, 20.55% (92) had an IOP of 11-14 mmHg, 53.42% (240) had an IOP of 15-18 mmHg, and 24.66% (112) had an IOP of 19-22 mmHg. The distribution of IOP was similar for both types of tonometry, with a slightly lower proportion of participants having low IOP values with air puff tonometry (7-10 mmHg) and a slightly higher proportion having high IOP values (19-22 mmHg) with Goldman tonometry.

Table 3: Different Categories of Intra-Ocular Pressure

IOP (Mm/Hg) Categories	Group A GAT (N = 450)	Group B AP (N = 450)
	Frequency %	Frequency %
7-10	37 (8.22%)	6 (1.37%)
11-14	123 (27.33%)	92 (20.55%)
15-18	160 (35.62%)	240 (53.42%)
19-22	130 (28.88%)	112 (24.66%)

DISCUSSION

The IOP readings recorded by the AP tonometer are slightly higher than those obtained from the GAT. There have been numerous studies comparing the IOP of GAT and APT [24, 25]. According to Friat *et al.*, results obtained with GAT are slightly lower than those obtained with non-contact tonometer [24]. As a result of Martinez-de-la-casa and colleagues' study, AP tonometer results were found to be higher than GAT results [26]. It was found that Tonnu *et al.*, measured different IOPs by using two different methods by 0.7 mm Hg [27]. APT offered more accuracy when IOP was over 20 mm Hg, according to Rao [28]. An APT measurement of IOP > 20 mm Hg or 30 mm Hg is unreliable, according to Osman EA *et al.*, [25]. The intraocular pressures of non-glaucomatous subjects were measured using NCTs and a GAT in a study by Bang *et al.*, which compared Goldmann applanation tonometer with three non-contact tonometers [29]. This study found that the Nidek NT-530P recorded lower intraocular pressure (IOP) readings than the Goldmann applanation tonometer, while the Topcon CT-IP and Canon T x 20P tonometers measured higher IOP readings [29]. According to research carried out by Sana Nadeem and colleagues, it was found that the amount of IOP in healthy adults was similar and showed a strong correlation [30]. The results suggest that APT could serve as an effective tool for identifying glaucoma in patients. Other research suggests that the non-contact air puff tonometer can be a speedy and valuable tool for initial screening and the IOP readings obtained from the non-contact tonometer with either one or three puffs (NCT 1 and NCT 3) were comparable to those from the Goldmann applanation tonometer [30]. However, due to the wide range of limits of agreement (LoA), it may not be feasible to use NCT (both 1-puff and 3-puffs) and GAT interchangeably, especially in patients with primary open angle glaucoma [31]. The results indicated that both techniques for measuring Intraocular Pressure (IOP) were linked to Central Corneal Thickness (CCT) in a favorable manner. Nonetheless, NCT was found to be more impacted by CCT than GAT when the CCT changed by ten microns. The expected change in IOP using NCT was 0.47 mm Hg, while with GAT, it was 0.29 mm/Hg [32]. The Goldman Application Tonometer and Air Puff Tonometer are frequently used in daily ophthalmic clinics [33]. The general consensus is that the Goldman Applanation Tonometer is more dependable and superior. Presently, it is the most commonly utilized device for measuring IOP and is regarded as the gold standard [34]. However, the findings of our study showed Air Puff Tonometer as almost equal when compared with the Goldmann Applanation Tonometer. Although the GAT is valuable, it has two limitations. The first one is that it necessitates direct touch between the sensor and the cornea, which may raise the chance of infection. Secondly, local anesthetics are necessary for its use, which some patients, especially children, may find difficult to tolerate. The study initiate that intraocular pressure readings obtained by a non-contact tonometer are clinically comparable to those obtained by a Goldman application tonometer in people with intraocular pressure within the normal range [35]. Previous investigations have indicated that the non-touch tonometer and GAT yield comparable outcomes among individuals with normal blood pressure. In a preceding research endeavor, the PT100 and GAT apparatuses were compared, revealing a significant concurrence between

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them, notwithstanding the non-touch tonometer's inclination to generate elevated IOP readings compared to the GAT for pressures below 21 mmHg. According to the research conducted by Salim and colleagues, there was a similar level of concordance between the two tools within the typical range of Intraocular Pressures (IOPs) [35]. However, as the measurements grew in magnitude, there was more significant variability observed. Additionally, another study found that both types of tonometers produced identical mean IOP results, with no notable difference in this research [36]. The PT100 non-contact tonometer is a handy device for measuring Intraocular Pressure (IOP) in children because it's easy to carry and use. But both it and the Goldmann applanation tonometer can be affected by corneal properties, especially the non-contact tonometer, which is more influenced by central corneal thickness. One study found that both methods reliably measure IOP within the same session and over multiple sessions, with no significant differences in readings between techniques. However, another study showed a significant difference in IOP measurements between two different instruments. Yet, when comparing the Canon TX10 NCT and GAT instruments, there were no significant differences in IOP readings. Both devices also showed good agreement between each other. Despite variations in central corneal thickness, there was no correlation found between CCT and IOP readings. The repeatability coefficients for GAT and TX-10 tonometers were 3.70 mmHg and 3.41 mmHg, respectively [37, 38].

CONCLUSIONS

The air puff tonometry method showed notably higher intraocular pressure readings compared to the gold standard applanation tonometry method. Thus, it's crucial to recognize the constraints and possible inaccuracies associated with using air puff tonometry for measuring intraocular pressure in clinical settings.

Authors Contribution

Conceptualization: YS
Methodology: YS, AJ
Formal analysis: YS, AJ
Writing, review and editing: AJ

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

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Original Article

Religious Coping and Emotional Adjustment among Patients Undergoing Dialysis: Treatment Perception as Moderator

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ABSTRACT

Kidney problems are increasing in world as well as in Pakistan. Waste produced in the human blood is filtered through kidneys. When human kidney fails to operate their functions properly, dialysis is the way people can live the rest of their life. **Objective:** To explore the moderating role of treatment perception on religious coping and emotional adjustment among patients undergoing dialysis. **Methods:** Treatment Perception Questionnaire, Brief R-Cope Scale and Emotional Adjustment Measure were used for data collection. 200 dialysis patients; 100 males, 100 females from 19-80 years were selected by using purposive sampling. **Results:** The results showed significant positive correlation among treatment perception, positive religious coping and emotional adjustment. Treatment perception is significant positive moderator between positive religious coping and emotional adjustment. Positive religious coping and emotional adjustment were greater in older patients, while negative religious coping is greater in younger patients. Female patients have perceived their treatment positively and have greater use of positive religious coping as a result they were more emotionally adjusted than male patients. Additionally, less treatment duration patients have high level of treatment perception, positive religious coping and emotional adjustment than patients having more treatment duration. **Conclusions:** The findings of this study will help clinical professionals and social workers to have better understanding of these variables, to introduce, promote and modify the required remedies and therapeutic techniques to help out the patients so that they can improve their level of religious coping and emotional adjustment.

INTRODUCTION

Every tenth person in the world has some sort of kidney problem as well as every year one in 10,000 people faces kidney failure. In Pakistan there are about two million kidney patients, with an increase of 20,000 new patients every year [1]. When human kidney fails its functions, dialysis is the only process to replace the functions of the kidneys [2]. Treatment perception refers to patient's perception about treatment procedures that whether their needs and wants of treatment are being fulfilled and satisfied [3]. Treatment procedure may consist of the ability, availability of treatment, material and outcome of received treatment. While moderately monitor the care center funders and providers, and treatment perception is believed to be a respected indicator of clinical practice. Perception of treatment may serve as a treatment result referee, while it is reasonable to assume that clients who are less pleased with treatment may leave or have a range of reactions to treatment intervention [4]. Patients undergoing dialysis face many psychological problems, documented regularly, as: joblessness, financial problems, regular hospitalizations, changes in family roles, shifting social and personal relationships, holiday boundaries, prohibitions on leisure, overemphasis on artificial kidneys. So they use defense mechanisms to cope with disease [5]. In religious coping patients cope with difficult situations by using religious means [6]. Religion is mainly a central

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source to cope with hard circumstances. Both positive and negative religious coping strategies implies universally by religion and traditions, although cultural differences exist in its coping types, styles and prevalence [7]. Religious coping has two dimensions positive religious coping reflects a trustful and pleasant relationship with God, includes strategies to spiritual guidance and compassionate reviews [8]. While negative religious coping constitutes a less secure connection to God, as religious dissatisfaction and harsh religious reassessments [9]. Emotional adjustment is not inclined to; feel negative emotions, develop irrational thoughts, or inhibit desires when faced with stressful life events. This includes short tempered, touchy, anxious, irritable, unstable, depressive and pitiful versus regulated, stable, calm, self-satisfied and cool characteristics [10]. Various end-stage renal disease associated stressors can have severe psychological consequences including anxiety and depression [11]. Previous studies mostly conducted on treatment perception, religious coping and emotional adjustment but either on one variable or another [12-14]. No prior research explains that how treatment perception moderates the relationship of religious coping and emotional adjustment specifically for patients undergoing dialysis, also fail to explain role of demographic characteristics of patients (duration of treatment, gender, age) on study variables. As previously least researches conducted on the interrelationship among religious coping, treatment perception, and emotional adjustment particularly in patients undergoing dialysis, so in the present conditions current study is very significant and cannot be neglected. This current study has significant implications for clinicians, psychotherapist, and social workers for developing better understanding of patients. Current findings are helpful for both introducing new therapies and updating the existing therapies to deal patients to improve their emotional adjustment level to gets better control on negative religious coping. This study helped to modify the practical approaches used by professional to make them more effective and productive.

This study aimed to check treatment perception as moderator in the relation of religious coping with emotional adjustment particularly in patients of undergoing dialysis; as well as to examine the interrelationship of these variables. Furthermore, this study also explained the role of demographic characteristics on the level of treatment perception, emotional adjustment, and religious coping in undergoing dialysis patients.

METHODS

The quantitative study was conducted on a sample of 200 dialysis patients (Male = 100 and Females = 100), from Nawaz Sharif Kidney Hospital Swat, Saidu Teaching Hospital Swat, King Abdullah Teaching Hospital Mansehra and Ayub Medical Complex Abbottabad, between June 2019 to September 2019. The registered cases during that time duration were 615; out of these 25% of population size was taken for sample selection. With the help of online Google calculator with 95% confidence interval and 5 % margin of error, the calculated sample size was 197. So on the whole 200 dialysis patients were selected for data collection in order to obtain desired sample size. Purposive sampling technique was used to select sample with age range 19-80 years. Sample was divided on the basis of treatment duration into two categories (less duration of treatment n = 78; long duration of treatment n = 122). Only those patients who were on dialysis treatment were included in the present study, kidney patients who were not on dialysis treatment were excluded from the current research study. Treatment Perception Questionnaire (TPQ), use five point Likert scale for scoring its 10 items [3]. Negative scoring items were 2, 4, 6, 8 & 9. Alpha reliability for TPQ was 0.83. Brief Religious coping scale has 14 items with 4 point scoring criteria [9]. Positive Religious Coping (PRC) was assessed with first 7 questions while Negative Religious Coping (NRC) was assesses with last 7 questions of scale. The alpha values of PRC and NRC are 0.93 and 0.82 respectively. Emotional Adjustment Measure (EAM) has 28 items, with six-point scale [15]. The reliability confident for EAM is 0.81. Prior permission and ethical approval from ethical committee of department as well as from relevant authorities, head of department and hospital in-charge has been obtained. Written informed consent was taken from participants for their willingness to participate. For data collection the selected scales were distributed among sample of patients. Instructions were given to respondents regarding scales and requested to read and fill every item of questionnaires. Finally, they were thanked for participation. Four statistical analyses (reliability, multiple hierarchal regression, correlation and t-test) were used to analyze data through 20.0 version of Statistical Package of Social Sciences (SPSS).

RESULTS

The data for the present study were collected from 200 dialysis patients, out of those, 100 were male patients and 100 were females, on the basis of treatment duration (patients with less duration of treatment were 78; patients with more duration of treatment were 122) and age range of the patients was 19-80 years. Alpha reliability of TPQ, PRC, NRC and EAM were 0.71, 0.81, 0.79, 0.90 respectively, indicating these scales as reliable measures. Significant item-total correlations indicate that all scales have satisfactory level of construct validity.

Table 1 shows significant positive correlation of TPQ with PRC and EAM, while it was significantly negatively related

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with NRC. PRC had significant negative association with NRC and had significant positive correlation with EAM. Similarly, NRC had significant negative association with EAM. Table revealed non-signification relationship of patients' age with TPQ and EAM, while it linked significantly positively with PRC and negatively significant with NRC.

Table 1: Correlation Matrix of Age, Emotional Adjustment Measure (EAM), Positive Religious Coping Scale (PRC), Treatment Perception Questionnaire (TPQ) and Negative Religious Coping Scale(NRC; N=200)

Scale	Age	TPQ	PRC	NRC	EAM	M ± SD
Age	-	0.131	0.212**	- 0.171*	0.033	41.12 ± 16.20
TPQ	-	-	0.691**	- 0.572**	0.674**	19.60 ± 3.84
PRC	-	-	-	- 0.742**	0.613**	20.98 ± 3.08
NRC	-	-	-	-	- 0.491**	15.89 ± 2.88
EAM	-	-	-	-	-	91.50 ± 15.12

Note: M = mean; SD = Standard Deviation.
p > 0.05, *p < 0.05, **p < 0.01

Table 2 identifies positive religious coping as significant predictor of emotional adjustment which created 37.2% variance in it. The next step also indicated treatment perception as significant predictor of emotional adjustment that added 12.1% more variance in it. The third step showed that the interaction of positive religious coping and treatment perception also significantly predicted emotional adjustment and create additional 1.1% variance in it. Overall, 50.4% variance created by positive religious coping, treatment perception and their interactions.

Table 2: Hierarchical Multiple Regression Analysis Predicting Emotional Adjustment (EA) from Positive Religious Coping (PRC) and Treatment Perception(TPQ)

Predictors	Variables	ΔR^2	*B*
Step I	-	0.372	-
	PRC	-	0.612**
Step II	-	0.121	-
	PRC	-	0.282**
	TPQ	-	0.483**
Step III	-	0.011	-
	PRC	-	-0.341
	TP	-	-0.482
	PRC*TPQ	-	1.461*
Total R^2	-	0.504	-

Note: Δ R2 = Delta R Square; β = Standardized Beta
p > 0.05, * p < 0.05, **p < 0.01

Table 3 shows significant differences of males and females on TP, PRC and EA, which showed that all three variables were more in females than male patients.

Table 3: Gender Differences on Treatment Perception (TP), Positive Religious Coping (PRC) and Emotional Adjustment (EA; N=200)

Variable	Male (100)	Female (100)	t (198)	p-Value	95% *CI*		Cohen's d
	M ± SD	M ± SD			LL	UL	
TP	18.38 ± 3.27	20.78 ± 4.92	3.90	0.001	-3.40	-1.39	0.66
PRC	20.11 ± 2.88	21.86 ± 3.01	4.23	0.03	-2.59	-0.94	0.59
EA	84.95 ± 11.90	98.03 ± 15.20	6.75	0.01	-16.9	-9.7	0.95

Note: M = Mean; SD = Standard Deviation; CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit

Table 4 shows significant differences in time duration of treatment on TP, PRC and EA. This showed that all these variables were greater in patients with treatment duration of less than a year than in patients with greater treatment duration.

Table 4: Differences in Time Duration of Treatment on Treatment Perception (TP), Positive Religious Coping (PRC) and Emotional Adjustment (EA; N = 200)

Variable	One Year or Less (78)	Greater than a Year (122)	t (198)	p-Value	95% *CI*		Cohen's d
	M ± SD	M ± SD			LL	UL	
TP	21.25 ± 3.74	18.52 ± 3.41	5.30	0.01	1.71	3.75	0.76
PRC	22.28 ± 2.60	20.15 ± 3.08	5.05	0.01	1.27	2.93	0.74
EA	99.06 ± 15.81	86.66 ± 12.52	6.13	0.01	8.39	16.34	0.86

Note: M = Mean; SD = Standard Deviation; CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit.

DISCUSSION

The current research explored the role of treatment perception between religious coping and emotional adjustment in dialysis patients. Another purpose was to investigate the role of demographic variables; age, gender and treatment duration on these variables. The data analysis showed significant positive correlation of PRC with TP and EA, while TP and EA have significant negative correlation with NRC. A previous study supported these results by finding low levels of pain in patients who use religious coping. Religious coping is very effective in chronic diseases [16]. Positive religious coping lowers emotional discomfort in chronic kidney disease patients [17]. Negative religious coping predicted higher level of behavioral and emotional problems in chronically ill patients [18]. The results indicated that positive religious coping, treatment perception and their interaction predicted emotional adjustment in significant positive way. Earlier findings concluded that treatment perception is a strong predictor of emotional adjustment in chronically ill patients [19]. Involvement in positive styles of religious coping minimizes symptoms of depression and maximizes emotional adjustment and has positive effects [20]. The results discovered significant positive association patients' age with positive religious coping and significant negative association of age with negative religious coping

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style whereas age has non-significant association with emotional adjustment and treatment perception. Previous researches concluded that older patients have high scores on positive religious coping than younger patients [21]. Emotional adjustment is higher in older than younger patients with chronic disease [22]. The results revealed significant gender differences on positive religious coping, emotional adjustment and treatment perception. Previous studies concluded that female scored higher on positive religious coping than male patients [21]. Male patients reported greater emotional distress than female patients [23]. The data analysis discovered significant differences of treatment duration on emotional adjustment, positive coping and treatment perception which showed that all of these variables are greater in individuals with less treatment duration than with more treatment duration. By concluding earlier studies; the negative perception of treatment in patients who have long-term dialysis has resulted in more daily life disturbances than the short-term dialysis patients [24]. People with long-term physical illness have higher emotional distress than people with short-term physical illness [25].

CONCLUSIONS

The present study concluded significant positive association among positive religious coping, emotional adjustment and treatment perception, whereas negative styles of religious coping had significant negative association with emotional adjustment and perception of treatment. Additionally, the study concluded significant association between age and involvement in positive ways of religious coping. Significant differences of gender indicated that women perceive their treatment more positively, had greater involvement in positive religious coping and they had greater emotional adjustment than males. Similarly, emotional adjustment, positive religious coping and treatment perception were significantly greater in those with less duration of treatment than inpatients with more treatment duration.

Authors Contribution

Conceptualization: TA
Methodology: SN, FKA
Formal analysis: HB
Writing, review and editing: HB, SN, FKA

All authors have read and agreed to the published version of the manuscript.

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Original Article

Efficacy of Combination of Topical Ketoconazole 2% Cream and Adapalene 0.1% Gel versus Topical Ketoconazole 2% Cream Alone in Treatment of Pityriasis Versicolor

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ABSTRACT

Pityriasis Versicolor (PV) is a superficial skin infection caused by *Malassezia* yeasts, resulting in hypo and hyperpigmented macules. It affects up to 40% of individuals, often leading to itching, decreased quality of life, and social stigma. **Objective:** To compare the efficacy of combination of topical ketoconazole 2% cream and adapalene 0.1% gel versus topical ketoconazole 2% cream alone in treatment of pityriasis versicolor. **Methods:** A comparative cross-sectional study was conducted at the Department of Dermatology, Nishtar Hospital, Multan, spanning from November 2020 to April 2021. Total 90 patients were divided equally into two groups: Group A received a combination of Ketoconazole 2% cream and adapalene 1% gel, while Group B received Ketoconazole 2% cream alone. The efficacy of both treatments was evaluated and compared. The study utilized SPSS version 26.0 for data analysis. **Results:** In terms of gender, 52.22% were male, and 47.78% were female across both groups. The mean duration of the disease was 5.84 ± 3.26 years in Group A and 6.04 ± 3.11 years in Group B, with an overall mean of 5.95 ± 3.17 years. The efficacy of Group A was 91.11%, with 41 participants showing positive results, while Group B had an efficacy of 75.56%, with 34 participants showing positive results. **Conclusions:** The study findings indicate that using a combination of adapalene 0.1% gel and ketoconazole 2% cream is more efficacious than using ketoconazole 2% cream alone in treating PV.

INTRODUCTION

Pityriasis versicolor, also known as tinea versicolor, is a common fungal infection of the skin characterized by the presence of hypo or hyperpigmented macules, most frequently observed on the trunk, neck, and proximal extremities. It is primarily caused by the overgrowth of *Malassezia* species, particularly *Malassezia* globosa and *Malassezia* furfurs, which are lipophilic yeasts normally residing on the skin [1, 2]. Factors contributing to the proliferation of Malassezia include warm and humid environments, increased sebum production, immunosuppression, hormonal fluctuations, and genetic predisposition. The transition of *Malassezia* from its yeast to its mycelial form is believed to play a pivotal role in the pathogenesis of pityriasis versicolor, leading to the disruption of normal skin pigmentation and the development of characteristic lesions [3]. Pityriasis versicolor is a ubiquitous dermatological condition, prevalent worldwide, with variations in incidence observed across different geographic regions and climatic conditions. In tropical regions, the prevalence of PV is as

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high as 50%, while in moderate and cold temperatures, it is estimated to be approximately 1-4% and 1% respectively [4]. The pathophysiology of pityriasis versicolor involves a complex interplay of factors contributing to the dysregulation of the cutaneous microbiome and the host immune response. *Malassezia* yeasts produce lipases and other enzymes that hydrolyze sebum triglycerides into fatty acids, creating an acidic environment that promotes fungal growth [5]. Furthermore, the presence of *Malassezia*-derived metabolites, such as azelaic acid, may induce alterations in melanocyte function, leading to the disruption of melanin production and subsequent pigmentary changes observed in pityriasis versicolor lesions. Dysfunctions in both innate and adaptive immune responses, as well as individual variations in host susceptibility, further contribute to the pathogenesis of the condition [6, 7]. Despite its benign nature, pityriasis versicolor often poses diagnostic and therapeutic challenges due to its chronic and recurrent course. Ketoconazole, a well-established antifungal agent, targets the fungal overgrowth responsible for the condition by inhibiting ergosterol synthesis in fungal cell membranes. Alone, it demonstrates significant efficacy in controlling the infection. However, the addition of adapalene, a third-generation retinoid, introduces an adjunctive therapy that addresses underlying inflammatory processes and abnormal keratinization associated with pityriasis versicolor[8, 9].

With limited research on combination therapy in Pakistan, this study underscored the need for investigation to enhance patient care. The rationale for this study lies in the therapeutic complexities of pityriasis versicolor, a condition known for its chronicity and recurrence. This study explored the efficacy of combining ketoconazole 2% cream with adapalene 0.1% gel for pityriasis versicolor, a condition known for its chronicity. By exploring this novel combination, it addressed the dual challenge of fungal overgrowth and inflammation, potentially improving treatment outcomes. This research filled a significant gap in the literature by comparing combination therapy to ketoconazole alone, offering valuable insights to optimize treatment approaches

METHODS

After approval from the hospital's ethical review board (vide letter #, REU/DER/14509, Date: 01/11/2020). The study design was comparative cross-sectional study. This study was conducted at Department of Dermatology Nishtar Hospital, Multan over a period of six months from November 2020 to April 2021 and included OPD patients. Written informed consent was obtained from all participants. A particular proforma was used to record each participant's medical history at the time of assessment. Sample size of 90 participants, with 45 individuals in each group, was calculated to keeping confidence interval of 95% and Power of test 80% taking anticipated efficacy of 90% in Group A (ketoconazole 2% cream plus adapalene 0.1% gel) and 72% in Group B (ketoconazole 2% cream alone) in patients diagnosed with pityriasis versicolor [17]. Patients of both genders diagnosed with pityriasis versicolor, aged 20 to 40 years having duration of disease ≤ 3 months with pityriasis versicolor which was diagnosed on presence of hyperpigmented macules discrete or confluent, slightly scaly macules showing yellow-green fluorescence under wood's lamp light. Patients with other dermatological conditions, pregnant or breastfeeding women, and those with contraindications to study medications were excluded. Participants were randomly assigned to one of two treatment groups: Group A: Combination therapy with topical ketoconazole 2% cream and adapalene 0.1% gel were applied once daily in morning to the affected areas for a duration of 4 weeks Group B: Topical ketoconazole 2% cream was given twice daily for 4 weeks. Administration of both topical medications ketoconazole 2% cream, both alone and in combination with adapalene 0.1% gel, was assessed using the fingertip unit method. This method involves applying 1 fingertip unit (equivalent to 0.5 gm of topical gel/cream) to cover 2% of the body surface area. Patients were instructed to cleanse the afflicted region with a gentle soap. Prior to each treatment application it was confirmed affected area dried then formulation was applied according to the extent of body surface area affected by pityriasis versicolor. The rule of 9 was utilized to calculate the body surface area. Patients were monitored at the second and fourth week. Compliance was evaluated on each subsequent appointment by inquiring about the patient's medicine usage, specifically if the cream or gel was applied correctly, at the appropriate time, and in the correct amount to the affected area. The patient's adherence to the physician's advice was considered as an indicator of compliance. After 4 weeks, both groups were assessed for the effectiveness of the treatment by a dermatologist with at least 5 years of experience after completing their fellowship. Efficacy of treatment was labeled upon disappearance of lesions at the end of 4 weeks. SPSS version 25.0 (IBM) was used to analyze the data. Results were presented as mean and standard deviation for quantitative variables i.e., age, weight, height, BMI and duration of disease. Frequency and percentage was calculated for qualitative variables like gender, body surface area involved, educational status, socioeconomic status and efficacy of drugs in both groups. Chi square was applied to compare the efficacy in both groups and p-value <0.05 was taken as significant. Effect modifiers like age, gender, BMI, education status, duration of disease and

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socioeconomic status were stratified and post-stratification chi-square was applied to see their effect on outcome. P-value <0.05 was taken as significant.

RESULTS

The mean age in Group A was 30.02 ± 6.05 years, while in Group B it was 29.98 ± 6.34 years, with an overall mean age of 29.87 ± 6.85 years. Most participants in both groups were aged 20-30 years, accounting for 55.56% in Group A and 60.0% in Group B, totaling 57.78% of the total participants. In our study there were 47 (52.22%) males and 43(47.78%) females. Among them, 24 males (51.06%) and 19 females (44.18%) were in Group A, while 23 males (48.93%) and 24 females (55.81%) were in Group B. The mean duration of the disease was 5.84 ± 3.26 years in Group A and 6.04 ± 3.11 years in Group B, with an overall mean of 5.95 ± 3.17 years. The mean duration of disease was 5.84 ± 3.26 years in Group A and 6.04 ± 3.11 years in Group B. Overall, the mean duration of disease was 5.95 ± 3.17 years. The mean BMI was 27.47 ± 4.50 in Group A and 27.62 ± 4.19 in Group B, with an overall mean of 27.39 ± 4.30. Regarding socioeconomic status, 42.22% of participants were classified as poor, 30.0% as middle, and 27.78% as upper. The majority of participants had ≤50% body surface area involved, accounting for 72.22% of the total participants as given in table 1.

Table 1: Details of Demographic Variables of Patients Included in Study

Variable	Characteristics	Group A	Group B	Total
Age	Mean ± SD	30.02 ± 6.05	29.98 ± 6.34	29.87 ± 6.85
	20-30	25 (55.56%)	27 (60.0%)	52 (57.78%)
	31-40	20 (44.44%)	18 (40.0%)	38 (42.22%)
Gender	Male	24 (51.06%)	23 (48.93%)	47 (52.22%)
	Female	19 (44.18%)	24 (55.81%)	43 (47.78%)
Duration of Disease	Mean ± SD	5.84 ± 3.26	6.04 ± 3.11	5.95 ± 3.17
	0-7 weeks	29 (64.44%)	28 (62.22%)	57 (63.33%)
	8-14 weeks	16 (35.56%)	17 (37.78%)	33 (36.67%)
BMI	Mean ± SD	27.47 ± 4.50	27.62 ± 4.19	27.39 ± 4.30
	Non-obese ≤ 30 kg/m^2	24 (53.33%)	25 (55.56%)	49 (54.44%)
	Obese > 30 kg/m^2	21 (46.67%)	20 (44.44%)	41 (45.56%)
Socioeconomic Status (income per day)	Poor (< 300 PKR)	18 (40.0%)	20 (44.44%)	38 (42.22%)
	Middle (300-1500 PKR)	14 (31.11%)	13 (28.89%)	27 (30.0%)
	Upper (>1500 PKR)	13 (28.89%)	12 (26.67%)	25 (27.78%)
Body Surface Area Involved	≤50%	33 (73.33%)	32 (71.11%)	65 (72.22%)
	≥50%	12 (26.67%)	13 (28.89%)	25 (27.78%)

The efficacy of Group A was 91.11%, with 41 participants showing positive results, while Group B had an efficacy of 75.56%, with 34 participants showing positive results. The p-value for the comparison between the two groups was 0.048 given in table 2.

Table 2: Comparison of Efficacy of Both Groups

Variables	Characteristics	Group A	Group B	p-Value
Efficacy	Yes	41 (91.11%)	34 (75.56%)	0.048
	No	4 (8.89%)	11 (24.44%)	

Table 3 presents the stratification of effectiveness for both drugs concerning gender, age, duration of disease, and BMI. For Gender in Group A, among males, 23 (92.0%) showed efficacy, while 18 (81.82%) did so in Group B, with p-values of 0.297 and 0.100, respectively. Among females, 18 (90.0%) in Group A and 16 (69.57%) in Group B showed efficacy, with p-values of 0.100 and 0.297, respectively. For Age in the age group of 20-30 years, 23 (92.0%) in Group A and 19 (70.37%) in Group B showed efficacy, with a significant p-value of 0.048. Among participants aged 31-40 years, 18 (90.0%) in Group A and 15 (83.33%) in Group B showed efficacy, with a p-value of 0.544. For duration of disease For participants with a duration of disease between 0-7 weeks, 26 (89.66%) in Group A and 22 (78.57%) in Group B showed efficacy, with a p-value of 0.251. Among those with a duration of disease between 8-14 weeks, 15 (93.75%) in Group A and 12 (70.59%) in Group B showed efficacy, with a p-value of 0.085. For BMI, among participants with BMI ≤ 30 kg/m2, 21(87.50%) in Group A and 18 (72.0%) in Group B showed efficacy, with a p-value of 0.178. For participants with BMI > 30 kg/m2, 20 (95.24%) in Group A and 16 (80.0%) in Group B showed efficacy, with a p-value of 0.136.

Table 3: Stratification of effectiveness of both drugs with gender, age, duration of disease & BMI

Variables	Category	Efficacy in Group A		Efficacy in Group B		p-value
		Yes	No	Yes	No	
Gender	Male	23 (92.0%)	02 (8.0%)	18 (81.82%)	04 (18.18%)	0.297
	Female	18 (90.0%)	02 (10.0%)	16 (69.57%)	07 (30.43%)	0.100
Age	20-30 years	23 (92.0%)	02 (8.0%)	19 (70.37%)	08 (29.63%)	0.048
	31-40 years	18 (90.0%)	02 (10.0%)	15 (83.33%)	03 (16.67%)	0.544
Duration of Disease	0-7 weeks	26 (89.66%)	03 (10.34%)	22 (78.57%)	06 (21.43%)	0.251
	8-14 weeks	15 (93.75%)	01 (6.25%)	12 (70.59%)	05 (29.41%)	0.085
BMI	≤30 kg/m^2	21 (87.50%)	03 (12.50%)	18 (72.0%)	07 (28.0%)	0.178
	>30 kg/m^2	20 (95.24%)	01 (4.76%)	16 (80.0%)	04 (20.0%)	0.136

Chi-square test observed difference was statistically insignificant

DISCUSSION

Topical therapy options for PV encompass lotions, shampoos and creams that are proven to be effective. These are administered on a daily basis or twice daily for different durations, rapidly enhancing clinical symptoms. Patient adherence may be influenced by the need for frequent and time-consuming applications, as well as by slight skin discomfort. Generalized topical therapies for PV do not particularly target Malassezia species. Instead, they

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employ physical or chemical methods to eliminate deceased contaminated tissue. Effective therapies for PV include selenium sulphide (in the form of lotion, shampoo or cream), propylene glycol, Whitfield's ointment, and zine pyrithione. These treatments have been found to be successful in addressing PV [10, 11]. In terms of age, our study found a mean age of 29.87 years, with a majority aged between 20 to 30 years. This aligns closely with the findings of Hameed *et al.*, who reported a slightly lower mean age of 28.42 years [12]. In our study, the combination therapy yielded an effectiveness rate of 91.11%, while ketoconazole 2% cream alone showed an effectiveness rate of 75.56%, with a statistically significant p-value of 0.048. Similarly, Hameed *et al.*, observed a higher frequency of improvement at 2 weeks with combination therapy compared to monotherapy (93.3% vs. 73.3%, p=0.000)[12]. Ashraf also reported a significantly higher frequency of improvement at 2 weeks with combination therapy compared to monotherapy (87.5% vs. 47.5%, p=0.000). These consistent findings across multiple studies underscore the efficacy of combination therapy in the treatment of pityriasis versicolor [13]. While Khan *et al.*, reported a notably younger mean age of 25.34 years. This contrasts with the male predominance reported by Khan *et al.*, with ratios of 2.1:1 [14]. These variations may be influenced by factors such as geographic location, genetic predisposition, environmental conditions, and study methodologies. In contrast, Wahid *et al.*, reported a significantly higher mean age of 51.3 years [15]. Our study findings align with those of Tawfik *et al.*, reported a significantly higher frequency of improvement with combination therapy compared to ketoconazole alone, with 96% of participants showing improvement in the combination therapy group compared to 74% in the ketoconazole alone group (P=0.023)[16]. The results of our study align with the findings of Shi *et al.*, who previously reported that the inclusion of adapalene 0.1% gel in 2% ketoconazole cream led to a significant increase in the proportion of patients (92% vs. 72%; P=0.0009) [17]. The results of our study are in line with previous research conducted by Anwar *et al.*, and Gobbato *et al* [18, 19]. Furthermore, our findings are consistent with those reported by Bakr *et al.*, who observed that a significant proportion of patients in both the combination therapy group and the monotherapy group experienced substantial improvement. Specifically, Bakr *et al.*, noted that 28 out of 30 patients (93.3%) in the combination group demonstrated marked improvement, while 25 out of 30 patients (83.3%) in the monotherapy group also showed significant improvement. These results provide additional support for the efficacy of both the combination therapy and monotherapy approaches in the treatment of the condition under investigation[20].

CONCLUSIONS

The study findings indicate that using a combination of adapalene 0.1% gel and ketoconazole 2% cream is more efficacious than using ketoconazole 2% cream alone in treating PV.

Authors Contribution

Conceptualization: FM
Methodology: FM, EK, WZA
Formal analysis: SS, SA
Writing-review and editing: AA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

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Original Article

Knowledge, Attitude and Practice among Nurses Regarding Prevention of Central Line Associated Bloodstream Infection in Tertiary Care Hospital of Peshawar

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ABSTRACT

Healthcare Associated Infections (HAIs), particularly Central Line-Associated Bloodstream Infections (CLABSIs), remain a significant global public health concern. CLABSIs, associated with catheter use, pose critical challenges in critical care and cancer treatment settings, necessitating evidence-based measures for prevention. **Objective:** To assess the knowledge, attitude and practice of nurses regarding prevention of central line associated bloodstream infection in tertiary care hospital of Peshawar. **Methods:** This conducted study possessed a cross sectional study design with a random sample of 173 nurses who were presently working or had worked in ICUs of the hospital. Data were collected through a self-administered questionnaire. Data analysis was performed on SPSS version 22.0. **Results:** 45% of nurses demonstrated good knowledge with mean score of 12.35 and standard deviation of ± 1.45, positive attitudes were observed in 74% with mean score of 33.7 and standard deviation of ±2.1 and good practices in 80% of participants with mean score of 40.5 and standard deviation of 1.45 observe. **Conclusions:** This study clearly indicated that majority of the nurses (54.9%) have poor knowledge regarding CLABSI. Despite of the poor knowledge level most nurses (74%) followed standard practice. Interestingly, greater number of nurses (85%) were found to have positive attitude towards CLABSI.

INTRODUCTION

Central line associated bloodstream infection is a concern in healthcare settings in critical care units as it jeopardizes patient safety. These infections can lead to rates of illness and mortality well as increased healthcare costs and a negative impact, on patient's quality of life. The ultimate goal is to prevent these infections [1, 2]. Central line associated bloodstream infections refer to bloodstream infections that are confirmed through laboratory tests and occur in patients who have had a line in place for at least 48 hours [3, 4]. Developing countries exhibit a incidence of central line associated bloodstream infections compared to developed nations as reported by the International Nosocomial Infection Control Consortium in 2016 [5-7]. By implementing measures we can substantially reduce the occurrence of central line associated bloodstream infections and enhance patient outcomes. Central line-associated bloodstream infections (CLABSIs) are the furthermost prevalent complication of central venous catheters (CVCs), happening at a rate of 4.1 per 1000 central line days. CLABSIs are associated with raised morbidity, mortality, and medical expenditures. Patients suffering with CLABSI face a 2.75-fold greater likelihood of yielding to their ailments within the confines of the hospital, as compared to those who do not suffer from CLABSI [8]. CLABSIs are largely viewed as preventable if healthcare practitioners follow the evidence-based directives for the

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insertion and maintenance of CVCs. Furthermore it is crucial to adhere to infection control practices like hand hygiene using sterile techniques during insertion and maintenance of the central line and regularly evaluating both the line and dressing [9-11]. Healthcare providers should also use barrier precautions when placing the catheter and utilize alcohol based 2% Chlorhexidine skin preparation [12, 13]. It is vital for healthcare providers to receive training and education on these measures as well as understand their importance, in reducing central line associated bloodstream infections [14, 15].

The aim of this study was to assess the knowledge, attitude and practice of nurses working in tertiary care hospital of Peshawar regarding prevention of central line associated bloodstream infections (CLABSIs) and to identify areas of improvement in their infection control practices

METHODS

For this study, cross-sectional study design was selected. The study was conducted at Khyber Teaching Hospital, Peshawar after taking ethical approval from Ethical Review Board vide letter KMU/INS/6203, dated September 25, 2023. 173 Nurses who were presently working or had worked in the ICUs of KTH were included in the study. Student nurses, nurses on leave and those nurses who did not want to participate were excluded in this study. To determine the sample size, we considered a 95% confidence interval, a margin of error 5%, assumed distribution of responses at 50% with population size of 312. Data were collected through modified adapted self-administered questionnaire. The questionnaire has been divided into four sections; demographic data such as gender, age and the number of years each participant has worked in clinical area; Knowledge section consisting of 9 questions regarding knowledge of CLABSI; a section a consisting of 9 questions regarding participant's attitude toward CLABSI prevention; and Practices related to CLABSI section had 10 questions. Score of 75 % and above categorize as to have good attitude and practice regarding CLABSI. To ensure confidentiality the completed questionnaires are collected anonymously. Participants are encouraged to provide honest responses. Prior to participation, all individuals provide consent. SPSS version 22.0 was used for data analysis. Descriptive statistics was used for demographic information. Cross table were generated to show the result and score with each demographic variable i.e. gender, qualification, years of experience and age of the participants.

RESULTS

The results are presented in form of tables. A total of 173 nurses (N=173) for participation. Among these, 86 (49.7%) were male and 86 (50.3%) were female. Majority of the participants i.e., 102 (59%) were Post-RN qualified, 65 participants (37.6%) were BSN and only 6 participants (3.5%) were qualified up to diploma level. The details have been given in the table 1.

Table 1: Demographic Variables of the Participants

Variables	Frequency (%)
Age	
25-30 Years	30 (17.3)
31-35 Years	115 (66.5)
35 and Above	28 (16.2)
Gender	
Male	86 (49.7)
Female	87 (50.3)
Qualification	
Diploma	06 (3.5)
Post RN	102 (59.0)
Generic BSN	65 (37.6)
Professional Experience of the Participants in Years	
<2 Years	41 (23.7)
<5 Years	73 (42.2)
>5 Years	59 (34.1)

45.1% of the nurses had good knowledge and 54.9% had poor knowledge regarding central line associated blood stream infection. Majority of the female were good knowledge. Moreover, Post-RN nurses were good in knowledge as compared to Diploma and BSN nurses. Attitude of nurses toward CLABSI was also measured. 84% of nurses observed as they had positive attitude while the remaining 15% had negative attitude. In addition to knowledge and attitude, practice investigation of nurses regarding CLABSI showed the score of 74% for practice according to the standard while 26 % were recorded against below standard practice (Table 2).

Table 2: Knowledge, Practice and Attitude Level of the Participants

Variables	Frequency (%)
Knowledge of the Participants	
Good Knowledge	78 (45.1)
Poor Knowledge	95 (54.9)
Total	173 (100.0)
Practice of Nurses regarding CLABSI	
Standard Practice	128 (74.0)
Below Standard Practice	45 (26.0)
Total	173 (100.0)
Attitude towards CLABSI	
Positive Attitude	147 (85.0)
Negative Attitude	26 (15.0)
Total	173 (100.0)

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DISCUSSION

According to this study results, 45% of the nurses were having good knowledge regarding central line associated blood stream infection. This study findings were in congruence with a study conducted at Egypt that showed 49% had good knowledge regarding CLABSIs [16]. Contrary to this, another study showed that only 22.1% of the nurses had good knowledge regarding CLASSBSIs [17]. Another study contradicted this study findings that showed 92% of the nurses had unsatisfactory knowledge level [18]. This study found that most of the nurses (74%) were excellent at maintaining sterility during CVC manipulation. This is in contrast to studies 37% of the nurses pointed out a lack of experience and training as reasons for noncompliance [19]. The study findings showed that 87% of the nurses changes the IV sets every seventy two hourly. These findings were in congruence to a study conducted in Bahrain that shows 89% of the nurses do similar practice [20]. According to this study findings, 80% of the nurses had positive attitude towards CLABSI. Similarly, a study conducted at Jeddah showed that 58% had positive attitude towards CLABSI prevention [14]. Another study conducted in Italy found that nurses had positive attitude toward the prevention guidelines of CLABSI [21]. Based on this study findings, 67% of the nurses revealed that nurses with 2 4 years of experience have an understanding of preventing Central Line Associated Bloodstream Infections (CLABSI). This aligns with findings from a study suggesting that more experience and regular training improves knowledge and practices of the nurses 32.9% related to CLABSI prevention [22]. According to this study results, majority of the nurses 74% consistently follow standard practices for preventing CLABSI. This study findings were similar to another study findings that showed 70% of the nurses follow guidelines of CLABSI prevention [6]. This study found that 87% of the nurses wash hands prior to changing the dressing on CVC insertion site. Similar findings were also found in a study conducted in Portugal in which 83.5% of the nurses wash hand before performing any dressing to the insertion site [23].

CONCLUSIONS

In conclusion, the results of this study clearly indicated that majority of the nurses (54.9%) have poor knowledge regarding CLABSI. Despite of the poor knowledge level most nurses (74%) followed standard practice. Interestingly, greater number of nurses (85%) in this study were found to have positive attitude towards CLABSI.

Authors Contribution

Conceptualization: MK, IWA
Methodology: MK, MW
Formal analysis: MK
Writing-review and editing: IWA, KH, M

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

A Cross-Sectional Preview of Correlates of Treatment Delay of Urinary Incontinence

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ABSTRACT

The prevalence of urinary incontinence in geriatric women and its silent endurance poses high emotional burden as stigma attached to this condition often leads to reluctance in seeking timely medical assistance. However, affirmation to common characteristics of delayed help seeking behaviour can identify vulnerable women for further assistance.**Objective:** To determine the correlates of treatment delay of urinary incontinence by evaluating common characteristics of those who had delayed their treatment. **Methods:** This cross-sectional study was conducted at Lady Willingdon Hospital's gynecology outdoors over a three-year period from June 1, 2019, to May31, 2022. Out of 364 incontinent women, 198 participants were selected with ages above eighteen and incontinence for at least one year. Demographic information and UI-related factors of the participants were collected and evaluated by dividing data into short (less than or equal to three years) and long (greater than three years) delay groups. Correlates of treatment delay were determined by regression analysis using SPSS version 20.0 (SPSS Inc., Chicago, IL, USA). **Results:** The respondents reported a treatment delay between one and thirty years; nearly half (59.60 percent) indicated a delay of more than three years. Age above fifty (odds ratio [OR] = 11.39; confidence interval [CI]: 4.30-30.18), embarrassment (OR = 3.63; CI: 1.19-11.12), lower subjective severity of symptoms (OR = 6.31; CI: 2.06-19.35), and stress incontinence (OR = 5.80; CI: 1.97-17.12) were significantly associated with treatment delay in regression analysis. **Conclusions:** In this study population, the correlates of treatment delay were age above fifty, embarrassment, lower subjective symptoms, and stress incontinence.

INTRODUCTION

Urinary incontinence (UI) is a common geriatric problem in women. International Continence Society (ICS) has defined incontinence as the lower urinary tract symptom characterized by involuntary urine loss [1]. The prevalence of UI has been stated 27.6% in a meta-analysis [2]. In rural areas of Sindh, the prevalence of UI stands at 11.5% [3], contransting with a prevalrence rate of 25% in urban areas [4].World Health Organization has designated UI as a priority health concern [5]. UI deteriorates women's quality of life (QOL) in two ways: physically by limiting their activities and psychologically by lowering their self-esteem [6]. Incontinent women also suffer from skin rashes, pruritis and recurrent urinary tract infections due to contact with urine-soiled cloths [7]. UI is a less severe disease, therefore many incontinent women continue to postpone their treatment for years due to fear of social stigma [8]. Further, insufficiently informed health care professionals ignore symptoms of UI patients and declare them as incurable [9]. UI treatment is beneficial at any age, and even a slight improvement in symptoms can have considerable benefits [10]. These women need to be counseled and directed to receive medical care, but identifying the women who will not pursue their treatment is a great challenge to health care professionals. Previous researchers have uncovered characteristics of the women with delayed help seeking behaviour. Correlates of treatment delay are common characteristics of a group of delayed help seeking women; they can be enlisted on

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outdoor tickets and their affirmation can point out the vulnerable woman who is likely to delay her treatment without additional support and encouragement. These factors vary in different countries depending on social and cultural attitudes and require separate researches in each location [11]. In Pakistani women, the common factors of UI treatment delay have not been assessed previously by other researchers. This study is a build-up of the previous work published by the author under the license CC BY 4.0 [12]. The objective of this study was to evaluate the correlates of treatment delay in urinary incontinence in Pakistani women.

METHODS

A cross-sectional study was conducted on urinary incontinent women in the Gynaecology department of Lady Willingdon Hospital, a King Edward Medical University affiliated hospital, from June 1, 2019, to May 31, 2022, after receiving Ethical approval from the University under IRB #711/RC/KEMU on May 2, 2019. We calculated the sample size of 217 participants for a population size of 400 (based on intelligent guess) at a 95% confidence level, 80% power, and a 10% dropout rate. A total 364 women presented with incontinence during the study period; 217 were randomly selected and completed the study questionnaires after providing written informed consent. Nineteen incomplete forms were discarded, and data from 198 completely filled survey forms were analyzed. Women with a history of urinary incontinence for at least one year and who had not previously sought treatment for the condition were assessed by medical officers trained in explaining the Performa and assisting in getting it filled. Inclusion criteria were a minimum age of 18 years and at least one episode of urine leakage per week for the previous three months. Exclusion criteria included urinary tract infection, pregnancy, women within three months postpartum or on waiting list for surgery for pelvic or abdominal masses, severe mental illness, terminal stage kidney or liver disease, or malignancy. Participants were selected by the chief investigator and provided written informed consent. Information on demographic characteristics, chronic illnesses, psychosocial effects of incontinence, and reasons for delay were collected using a self-designed survey form. Data was divided into two groups based on the duration of incontinence reported by the participants: short delay (less than or equal to three years) and long delay (more than three years) [13, 14]. Demographic variables included age group (pre or postmenopausal), marital status, parity, educational level, socioeconomic status, and employment status. Subjective and objective severity of symptoms and UI type were determined using the Urdu version of the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI SF). Subjective severity was determined by asking participant to point out on a visual analogue scale (score from 0-10) how much leaking urine interfered with their daily lives (ICIQ-UI SF question # 5); the response was recorded to create three degrees of UI severity: mild (0–3), moderate (4–7), and severe (8–10). The objective severity was determined based on response to questions 3 and 4 of the ICIQ-UI SF, namely how frequently did they lose urine (score: zero to five on the visual analogue scale) and how much urine they believed leaked (score: 2, 4 and 6 on the scale). The combined maximum score of both questions was up to 11, which was computed into three severity levels: mild (1-4), moderate (5-8), and severe (9-11). The UI type was determined using responses to ICIQ-UI SF question # 6 i.e. when does urine leak. If women were incontinent only during coughing, sneezing, physical activity or exercising, they had stress incontinence. Urinary leakage before reaching the toilet, while sleeping, or for no apparent cause, was suggestive of urgency incontinence. Positive responses to both types of questions indicated mixed incontinence. IBM SPSS version 20 was used to calculate the study's results (SPSS Inc., Chicago, IL, USA). The numerical data was calculated as the mean and standard deviation and nominal data as numbers and percentages. Univariate analysis was performed on all risk factors for treatment delay followed by multivariate analysis to eliminate factors with a low predictive value. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Total 364 incontinent women reported during the study period of three years; 198 women fulfilled the study criteria and were selected as participants as shown in figure 1.

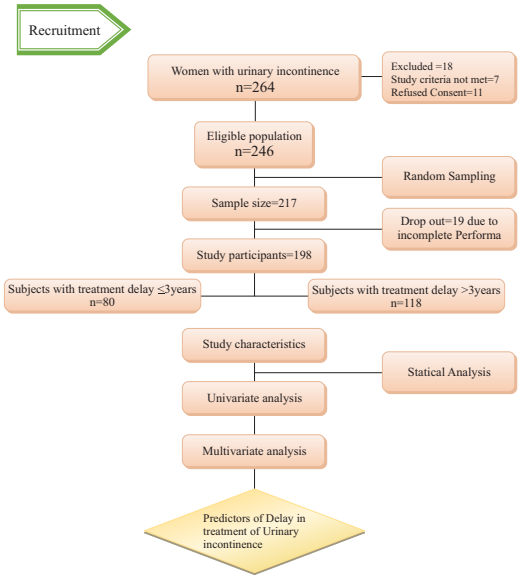

Figure 1: Prisma flow diagram of recruitment and statistical analysis

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The participants age ranged from 33 to 77 years (mean 57.21 ± 10.40 years), with only about one quarter under fifty. Over half of the participants experienced a delay of more than three years (59.60 percent). The mean basal metabolic index (BMI) was 28.34 ± 3.85 Kg/m^2, ranging from 18.34 to 36.94 Kg/m2. The majority of participants were married with high parity, belonged to lower or middle socioeconomic groups, were less educated, and unemployed. Hypertension, diabetes, asthma, and cardiac disease were prevalent among incontinent women. The majority of participants were menopausal and experienced a longer delay. Participants with a high BMI (83.3 percent) outnumbered those with normal (15.7 percent) or low (1 percent) BMI. Majority (90.4 percent) were married, had high parity (58.1 percent), were less educated (60.6 percent illiterate), unemployed (80.3 percent), and came from lower and middle-income families (41.9 and 32.8 percent, respectively). Hypertension (33.8 percent), diabetes (33.3 percent), heart disease (10.1 percent), and asthma (10.6 percent) were common ailments. The delay in treatment was short for asthmatic patients, while all other chronic disorders were associated with a long delay. The characteristics of participants with urinary incontinence are summarized in table 1.

Table 1: Characteristics of the study population

Population Characteristics (*n* = 198)		Category/Mean ± SD	Number of participants (%)
Mean age (years)		57.21 ± 10.40 (33-77)	198 (100)
Mean delay(years)		5.83 ± 4.74 (1-30)	198 (100)
Mean age of long delay group		60.66 ± 9.768	118 (59.60)
Mean age of short delay group		52.13 ± 9.193	80 (40.40)
Basal metabolic rate (Kg/m^2)		28.34 ± 3.85 (18.34-36.94)	198 (100)
Age groups	Premenopausal	31-40	15 (7.6)
		41-50	39 (19.7)
	Postmenopausal	51-60	70 (35.4)
		61-70	48 (24.2)
		71+	26 (13.1)
Marital status		Unmarried	19 (9.6)
		Married	179 (90.4)
Parity		Nullipara	25 (12.6)
		Low parity (1-3)	58 (29.3)
		High parity (4-6)	115 (58.1)
Socioeconomic status		Low	83 (41.9)
		Middle	65 (32.8)
		High	50 (25.3)
Education		Illiterate	44 (22.2)
		up to metric	120 (60.6)
		college and above	34 (17.2)
Employment status		Unemployed	159 (80.3)
		Working women	39 (19.7)
Chronic illnesses		Hypertension	67 (33.8)
		Diabetes	66 (33.3)
		Asthma	21 (10.6)
		Cardiac disease	20 (10.1)

The study characteristics and their associated treatment delays are summarized in table 2.

Table 2: The Demographic features and delay in treatment of incontinence

Variables		Number (%)	Duration of treatment Delay (Median range)
Age Groups According To Menopause (Years)	Premenopausal	54 (27.3)	2 (1-8)
	Postmenopausal	144 (72.7)	6 (1-30)
BMI (Kg/m^2)	Underweight	2 (1)	3 (1-5)
	Normal	31 (15.7)	4 (1-9)
	Overweight	104 (52.5)	4 (1-24)
	Obese	61 (30.8)	6 (1-30)
Marital Status	Unmarried	19 (9.6)	4 (1-12)
	Married	179 (90.4)	5 (1-30)
Parity	Nullipara	25 (12.6)	3 (1-12)
	Low parity (1-3)	58 (29.3)	3 (1-15)
	High parity (4-6)	115 (58.1)	5 (1-30)
Socioeconomic Status	Low	83 (41.9)	5 (1-30)
	Middle	65 (32.8)	6 (1-19)
	High	50 (25.3)	3.5 (1-13)
Education	Illiterate	44 (22.2)	4.5 (1-20)
	Up to metric	120 (60.6)	5 (1-30)
	College and above	34 (17.2)	3.5 (1-13)
Employment Status	Unemployed	159 (80.3)	5 (1-30)
	Working women	39 (19.7)	3 (1-12)
Chronic Illnesses	Hypertension	67 (33.8)	7 (1-30)
	Diabetes	66 (33.3)	4 (1-24)
	Cardiac disease	20 (10.1)	5 (1-20)
	Asthma	21 (10.6)	3 (1-13)

In the long delay group, the majority of women were menopausal (53 versus 19.7 percent), whereas in the short delay group, premenopausal women were slightly more common (20.7 versus 19.7 percent). Menopausal age and high parity were significantly correlated with UI treatment delay shown in Table 3.

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Table 3: Demographic features and treatment delay-Univariate analysis

Variables		Short Delay Number (%) n=80	Long Delay Number (%) n=118	N (%)	OR (CI)	p-value
Age Group	Premenopausal	39 (19.7)	105 (53)	144 (72.7)	8.49 (4.12-17.52)	<.0001*
	Postmenopausal	41 (20.7)	13 (6.6)	54 (27.3)	-	<.0001*
BMI groups	Underweight	1 (.5)	1 (.5)	2 (1)	-	.903
	Normal	11 (5.6)	20 (10.1)	31 (15.7)	1.82 (.103-31.99)	.683
	Overweight	44 (22.2)	60 (30.3)	104 (52.5)	1.36 (.08-22.40)	.828
	Obese	24 (12.1)	37 (18.7)	61 (30.8)	1.54 (.09-25.84)	.763
Marital Status	Unmarried	9 (4.5)	10 (5.1)	19 (9.6)	-	.819
	Married	71 (35.9)	108 (54.5)	179 (90.4)	1.369 (.530-3.536)	.517
Parity	Nullipara	13 (6.6)	12 (6.1)	25 (12.6)	-	.004*
	Low parity (1-3)	32 (16.2)	26 (13.1)	58 (29.3)	.880 (.344-2.253)	.790
	High parity (4-6)	35 (17.7)	80 (40.4)	115 (58.1)	2.476 (1.028-5.966)	.043*
Education	Illiterate	17 (8.6)	27 (13.6)	44 (22.2)	-	.46
	Up to metric	46 (23.2)	74 (37.4)	120 (60.6)	1.013 (.498-2.060)	.972
	College and above	17 (8.6)	17 (8.6)	34 (17.2)	.630 (.255-1.557)	.317
Employment Status	Unemployed	60 (30.3)	99 (50)	159 (80.3)	-	.125
	Working women	20 (10.1)	19 (9.6)	39 (19.7)	.576 (.284-1.165)	
Socioeconomic Status	Low	33 (16.7)	50 (25.3)	83 (41.9)	-	.217
	Middle	22 (11.1)	43 (21.7)	65 (32.8)	1.290 (.656-2.537)	.460
	High	25 (12.6)	25 (12.6)	50 (25.3)	.66 (.325-1.339)	.250
Chronic Illnesses	Hypertension	22 (11.1)	45 (22.7)	67 (33.8)	1.625 (.878-3.007)	.122
	Diabetes	27 (13.6)	39 (19.7)	66 (33.3)	.969 (.531-1.769)	.918
	Cardiac disease	6 (3)	14 (7.1)	18 (9.1)	1.66 (.610-4.521)	.321
	Asthma	12 (6.1)	9 (4.5)	21 (10.6)	.468 (.187-1.169)	.104

Regarding psychosocial effects, common responses included low self-esteem (39.9 percent) and feeling odd among others in gatherings, praying, and traveling in public transport (29.3 percent). Other responses included avoiding sex (15.7 percent) and feeling avoided by others (15.2 percent). Reasons for delaying treatment included feeling too embarrassed to disclose their problem (33.8 percent), waiting for spontaneous recovery, and using self-designed techniques to control urine (30.8 percent). Women also delayed treatment out of fear of surgery (15.7 percent) and believing that UI was due to their chronic illness or drugs (19.7 percent) and untreatable until their chronic disease was cured. Mixed incontinence was the most prevalent type (35.4 percent), followed by stress incontinence (32.3 percent) and urge incontinence (32.3 percent). Stress incontinence was the most common type among women who delayed their treatment shown in table 4. Univariate analysis showed that avoiding sex, feeling avoided by others, using self-designed urine control techniques, embarrassment, lower subjective severity of symptoms, and stress incontinence were significant factors.

Table 4: UI related factors and treatment delay-Univariate analysis

Variables		Short Delay n=80	Long Delay n=118	Total subjects n=198	OR (CI)	p-value
Psychosocial Effects	Low self esteem	32 (16.2)	47 (23.7)	79 (39.9)	.993 (.556-1.773)	.981
	Avoid sex	18 (9.1)	13 (6.6)	31 (15.7)	.426 (.196-.930)	.032*
	Feeling odd among others	23 (11.6)	35 (17.7)	58 (29.3)	.1.045 (.559-1.952)	.890
	Feeling of being avoided by others	7 (3.5)	23 (11.6)	30 (15.2)	2.525 (1.027-16.206)	.044*
Reason for Delay	Waited for spontaneous recovery and used control techniques	32 (16.2)	29 (14.6)	61 (30.8)	.489 (.265-.902)	.022*
	Too embarrassed	11 (5.6)	56 (28.3)	67 (33.8)	5.666 (2.726-11.78)	<.0001*
	Fear of surgery	19 (9.6)	12 (6.1)	31 (15.7)	.363 (.165-.800)	.012*
	Symptoms are due to other diseases	18 (9.1)	21 (10.6)	39 (19.7)	.746 (.368-1.510)	.415
Subjective Severity of UI Symptoms	Mild	7 (3.5)	40 (20.2)	47 (23.7)	7.238 (2.842-18.434)	<.0001*
	Moderate	35 (17.7)	48 (24.2)	83 (41.9)	1.737 (.909-3.318)	.094
	Severe	38 (19.2)	30 (15.2)	68 (34.3)	-	<.0001*
Objective Severity of UI Symptoms	Mild	20 (10.1)	44 (22.2)	64 (32.3)	1.548 (.703-3.41)	.278
	Moderate	41 (20.7)	47 (23.7)	88 (44.4)	.807 (.392-1.659)	.559
	Severe	19 (9.6)	27 (13.6)	46 (23.2)	-	.165

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Type Of UI	Stress incontinence	11 (5.6)	53 (26.8)	64 (32.3)	5.115 (2.459-10.639)	<.0001*
	Urgency incontinence	37 (18.7)	27 (13.6)	64 (32.3)	.345 (.187-.637)	.001*
	Mixed incontinence	32 (16.2)	38 (19.2)	70 (35.4)	.713 (.395-1. 287)	.261

Values are means SD, (range) and number (proportions). Short delay=Delay < 3years, Long delay=Delay longer than 3years. OR (CI) =Odds ratio (Confidence interval), p-value of univariate analysis, Significant p-value < .05 *

Multivariate analysis revealed that menopausal women, those with lower subjective severity of symptoms, too embarrassed to discuss their problem, or experiencing stress incontinence were most vulnerable to treatment delay. Other significant factors from univariate analysis had low predictive value in multivariate analysis shown in table 5.

Table 5: Common factors of UI treatment delay-Multivariate analysis

Variables	OR (CI)	p- value
Menopausal Age Group	9.921 (3.977-24.747)	<.0001*
Mild Subjective Severity of Symptoms	4.904 (1.55-15.515)	.007*.
Feeling Embarrassed	2.852 (1.212-6.710)	016*
Stress Incontinence	8.216 (2.97-22.72)	<.0001*

Values are OR(CI) =Odds ratio (Confidence interval) of univariate analysis, P-value of multivariate analysis by forward LR, Significant p-value < .05 *

DISCUSSION

Previous literature advises to apply health behaviour change theories to guide research on urinary incontinence [15].However, only a few studies have focused on finding out the characteristics of women that correlate with delayed help-seeking behaviour [16].Our study in Pakistani women identified menopausal age, embarrassment, lower subjective symptom severity, and stress incontinence as correlates of treatment delay. Menopausal age was a common characteristic among women who delayed treatment, consistent with international studies [17, 18] Urinary incontinence is also one of the most well-known geriatric syndromes that has been recorded in the literature [19]. Despite being related to aging, UI is treatable even in frail individuals [20]. Surgical and nonsurgical therapies are available to improve bladder capacity and support the urethra [21, 22]. Unlike previous studies, demographic factors such as marital status, parity, education level, and socioeconomic status did not indicate treatment delay in our study [23]. Similarly, chronic medical conditions did not affect the time to seek medical care, highlighting the variability in UI correlates across different countries [24]. While previous research has shown psychosocial implications like sexual dysfunction and difficulty in praying as risk factors for treatment delay, our study found these to be less frequent and not significant correlates [25]. Embarrassment emerged as a strong predictor of delaying UI treatment, consistent with previous research citing embarrassment in discussing the issue with others as a common reason for delay [16]. Other reasons for delay, such as waiting for spontaneous recovery, fear of surgery, and linking UI with other diseases, were also reported by patients in our study though results were insignificant [25]. Interestingly, while Objective UI severity is often a predictor of help-seeking behavior, our study found that lower subjective severity of symptoms, rather than objective severity, was associated with longer treatment delay [26]. Mixed incontinence was the most common type in our study population, differing from international trends where stress urinary incontinence (SUI) is more prevalent [27]. Our data reveals mixed incontinence as the commonest type in Pakistan although women with SUI are at a significant risk of delaying treatment. Researchers have found SUI a significant predictor of treatment delay and recommended personalized, customized programs for mild to moderate SUI [13]. However, women with SUI were significantly more likely to delay treatment, suggesting the need for personalized treatment programs, including lifestyle adjustments, Kegel exercises, and medications before considering surgery [28]. Despite limitations such as a small sample size and being a single-center study, our findings shed light on the factors contributing to treatment delay in UI among Pakistani women. Future research across different communities in Pakistan is needed to validate these results for clinical practice.

CONCLUSIONS

Urinary incontinence is a highly neglected problem among women, leading to psychological issues. According to this study, the menopausal age, lesser severity of subjective complaints, embarrassment at disclosing the problem, and stress incontinence are correlates of treatment delay of UI which need to be focused to provide counselling and UI treatment. All women presenting with urinary incontinence should be evaluated for correlates of treatment delay, and the topic of incontinence should be brought to the attention of susceptible women to articulate their problems. In addition, as embarrassment has been identified as a significant factor in this and other studies, dedicated clinics should be established in each hospital to refer women to qualified medical professionals who can thoroughly examine their urinary problems in isolation and address their psychological and medical needs.

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Authors Contribution

Conceptualization: AJ, AZE, SS
Methodology: AJ, AZE, SS
Formal analysis: AJ, AZE, SS
Writing-review and editing: AJ, AZE, SS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Depression, Anxiety and Stress among Undergraduate Students of Shah Abdul Latif University, Khairpur

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ABSTRACT

Higher rates of stress, anxiety, and depression are seen among university students. **Objective:** To find out the prevalence of stress, anxiety, and depression among undergraduate students. **Methods:** This was a cross-sectional survey study. The study was conducted among undergraduate students of Shah Abdul Latif University, Khairpur. The Depression Anxiety Stress Scale (DASS-21) was distributed to undergraduates in their first through last year of university. 132 students completed the DASS survey. We used Fisher's exact tests to compare the variations between the student groupings. **Results:** There were 132 students in all, and their mean age was 20.75 ± 2.1 years. The participants were categorized into two age groups: the first age group consisting of those aged 17-19 years, accounting for 63 (47.7%), and the second age group including individuals aged 20-22 years, representing 69 (52.3%). The male students were represented by 75 (56.8%), while the female students were represented by 57 (43.2%). Over 82 (62.1%) of students had a poor socioeconomic status. **Conclusions:** Female students were found with high frequency of depression, stress and anxiety.

INTRODUCTION

Major depressive disorder is most common mental disorders, and the university years are a risk period for the development of these disorders [1]. Depression affects 350 million individuals every year [2]. Young people experience stress and despair since they are going through a phase of identity development shift [3]. Academic, social, sexual, emotional, and behavioral issues are among the many that they face [4]. Mental health issues that manifest during college are linked to significant psychosocial functioning impairment and lower academic attainment; due to their efforts in managing the intellectual and interpersonal requirements in anticipation of their future occupations [5, 6]. Many research theories state that university students are more susceptible to depression because they have additional responsibilities, like pressure to continue their education, changes in housing and lifestyle, pressure from the economy or their jobs, etc [7]. Preparing for life after college involves more than simply meeting academic and social obligations; it also requires adjusting to a number of psychological adjustments [6]. Depression and stress are

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more common among young individuals since they are still developing their sense of self [3]. Conflicts of all kinds emotional, behavioral, sexual, economic, academic, and social affect the majority of these students [4]. Student depression is caused by homesickness, academic demands, and aspirations for a better and more secure future [8]. Students at universities who are loaded by observed mental stress may see a decline in their physical and mental well-being as well as their academic performance [9]. Stress can make it more difficult for pupils to focus, make decisions, solve problems and generally enjoy learning [10]. Students who experience high amounts of stress are more likely to engage in bad eating habits, which raises their risk of metabolic syndrome and other cardiovascular problems in the future [11, 12]. Stress can also have an impact on relationships with others and one's mental state. It can also make students more susceptible to anxiety disorders, despair, and even suicide [13, 14]. Depression is a major mental health issue that may have a significant impact on students' lives, according to the current research. The incidence of depression in boys and females are about equal before puberty, but almost treble in females after puberty hits. Students' social, vocational, and interpersonal functioning is negatively impacted by depression due to its severe impacts; In addition, students who experience depression often struggle with many academic issues, including difficulty focusing and a general lack of enthusiasm for their studies [15]. On top of that, they deal with emotional issues including insecurities, irritability, sleep disturbances, and unpredictable analytical abilities [16]. Depression among students may be caused by a number of things. Depression among students may be triggered by increased academic pressure, changes in family dynamics, and social life adjustments [16]. A similar correlation exists between the study of certain classes and emotional distress [17]. One of the most common mental health issues today is depression, which has its roots in the increasing complexity of contemporary life brought about by factors such as westernization, modernization, and the prevalence of modern communication and technological tools [2]. The frequency of depression among students is influenced by socio-economic variables. For example, research shows that students from lower socioeconomic classes are more likely to suffer from depression due to their financial fragility [18]. To the best of our knowledge, not much is known regarding the prevalence of stress, anxiety, and depression among the undergraduate students of Shah Abdul Latif University, Khairpur.

This study's goal was to evaluate these undergraduate students' degrees of stress, anxiety, and depression. As a result, this knowledge may be useful in developing a future mental health management program that targets their primary risk factors and provides them with the tools they need to successfully manage stress, anxiety, and depression while attending college.

METHODS

This research was conducted using a cross-sectional survey design. The research was carried out at Shah Abdul Latif University, a government-funded institution located in the city of Khairpur. The study conducted from 10-02-2024 to 10-03-2024. The university provides interdisciplinary programs including natural sciences, social sciences, and physical science studies. The assessment of mental health state was conducted using the Depression Anxiety Stress Scales (DASS) in a cross-sectional survey. All undergraduate students included and M.Phil and Ph.D students excluded. Ethical approval was obtained from institutional board of advance research at Shah Abdul Latif University, Khairpur (Reference No: RB-C620, Date: 08/02/2024). In order to quantify stress, anxiety, and depression, the DASS-21 is used [19]. The following measurements were made of this scale's validity and reliability among students [20]. The DASS-21 scale's dependability was assessed using a range of 0.81 to 0.97. Score 34 or above for extremely severe, score 26 to 33 for moderate, score 19 to 25 moderate, score 15 to 18 for mild, and score 0 to 14 for normal are the categories for the DASS-21 subscale for stress. For normal score 0 to 7, for mild score from 8 to 9, for moderate score from 10 to 14, for severe score 15–19, and for very severe score 20 and above are the different categories for anxiety levels. Respondents' degrees of depression are divided into four categories: for mild score from 10 to 13, for moderate score from 14 to 20, for severe score from 21 to 27, and for very severe score from 28 or above. The DASS-21 is the scale utilized in this study since it is valid and trustworthy, and past research has shown that it is superior to and more consistent than the full-scale DASS-42 [20]. The total number of students at Department of Pharmacy, Zoology and Microbiology in year 2019 to 2023 was 428 (240 females and 188 males). They were given the self-assessment forms during and after class. It took around fifteen minutes to fill out the form. The participation percentage was 88%, with 132 completed surveys returned out of 150 that were sent. An online sample size calculator was used to determine the sample size. Data were entered and analyzed on SPSS version 26.0 and Excel 365. Age, stress, anxiety, and depression scores (means and standard deviations), and qualitative variables (number and percentage) were used to summarize the data. Group comparisons for qualitative variables were conducted using Fisher's exact test. A p-value of less than 0.05 was considered statistically significant.

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RESULTS

There were 132 students in all, and their mean age was 20.75 ± 2.1 years. The participants were categorized into two age groups: the first age group consisting of those aged 17-19 years, accounting for 63 (47.7%), and the second age group including individuals aged 20-22 years, representing (69) 52.3%. Of the total number of students, 75 (56.8%) were male, and 57 (43.2%) were female. More than 82 (62.1%) of pupils were from low-income families (Table 1).

Table 1: Sociodemographic Characteristics of the Students

Characteristics	N (%)
Age Groups (Years)	
17 – 19	63 (47.7%)
20 – 22	69 (52.3%)
Gender	
Female	57 (43.2%)
Male	75 (56.8%)
Marital Status	
Married	12 (9.1%)
Single	120 (90.9%)
Socioeconomic Standard	
Middle Income	50 (37.9%)
Low Income	82 (62.1%)
Academic Years	
1st Year	44 (33.3%)
2nd Year	35 (26.5%)
3rd Year	17 (12.9%)
4th Year	20 (15.2%)
5th Year	16 (12.1%)

Table 2 reveals that over 78 (59.1%) of study participants experienced anxiety, with females having a higher prevalence than men (p-value ≤ 0.05). The prevalence of depression among students was near 102 (77.3%) with increasing prevalence in females 48 (84.2%) than males 54 (72%), (p-value ≤ 0.05). Stress was detected in 20 (15.2%) of students with increasing frequency in female 12 (21.1%) than males 3 (4.0%), p-value ≤ 0.05.

Table 2: Frequency of Anxiety, Depression, and Stress According to Gender and Severity Level

Grades	Total N (%)	Male N (%)	Female N (%)	p-value
Anxiety Score				
Normal	54 (40.9%)	39 (52.0%)	15 (26.3%)	≤ 0.05
Mild	21 (15.9%)	12 (16.0%)	9 (15.8%)	
Moderate	30 (22.7%)	15 (20.0%)	15 (26.3%)	
Severe	24 (18.2%)	9 (12.0%)	15 (26.3%)	
Very Severe	3 (2.3%)	0	3 (5.3%)	
Depression Score				
Normal	30 (22.7%)	21 (28.0%)	9 (15.8%)	≤ 0.05
Mild	36 (27.3%)	21 (28.0%)	15 (26.3%)	
Moderate	30 (22.7%)	21 (28.0%)	9 (15.8%)	
Severe	9 (6.8%)	9 (12.0%)	0	
Very Severe	27 (20.5%)	3 (4.0%)	24 (42.1%)	
Stress Score				
Normal	117 (88.6%)	72 (96.0%)	45 (78.9%)	≤ 0.05
Mild	12 (9.1%)	3 (4.0%)	9 (15.8%)	
Moderate	3 (2.3%)	0	3 (5.3%)	
Severe	0	0	0	
Very Severe	0	0	0	

DISCUSSION

Overall, 20 (15.2%) of undergraduates reported experiencing stress, according to this research. Comparable stress outcomes were seen in 12.5% of University College of Medicine and Dentistry, Lahore Dentistry Students [21]. Annosha *et al.*, conducted a cross-sectional study on physiotherapy students at Physiotherapy Institute of Sindh and reported higher rate of stress in 53.2% of students [22]. Prior research from various nations has documented a diverse range of prevalence rates; two studies conducted in Saudi Arabia documented stress rates of 71.9% and 57%, respectively [23, 24]. The percentage was 41.9% in Malaysian and 61.4% in Thai people [25, 26]. The observed variance may be attributed to cultural disparities, disparities in the healthcare system, and disparities in the research population and methodologies. One of our instruments is the Depression, Anxiety and Stress Scale-21 Items (DASS-21) questionnaire. The DASS-21 is a relevant and reliable tool for measuring stress, anxiety, and depression, according to a number of studies]. This tool serves just as an indication and cannot substitute a clinical evaluation. It is appropriate for assessing individuals who are within the typical range of adolescence and adulthood. Taouk et al., conducted psychometric validation of this measure for the Arabic culture [28]. In present study, among undergraduates surveyed, 102 (77.3%) and 78 (59.1%) reported suffering from depression and anxiety, respectively. Najma *et al.*, reported lower rate of Depression in 31% and anxiety in 41.9% students of University, College of Medicine and Dentistry Lahore [21]. The prevalence of depression and anxiety at Menoufiya University was revealed to be 63.6% and 78.4% respectively, which is higher than the values reported in prior research performed in Egyptian Institutions, among the medical students at Alexandria University, 43.9% experienced anxiety and 57.9% depression [29, 30]. A different research among medical students at Mansoura University found lower prevalence rates of depression and anxious symptoms, at 28.3% and 21.2%, respectively [31]. Additionally, our results are consistent with those from other nations; for example, among Pakistani medical students, a prevalence of 70% was recorded for anxiety and depression Jadoon *et al.*, [32]. Found that among 482 medical students, anxiety and depression were prevalent

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at a frequency of 43.89 percent [33]. It was 33% in Iran and 27.63% in Beirut [34]. According to the present research, there is a gender difference in self-reported stress and anxiety, with women reporting far greater levels of both than men. A study carried out at Menoufyia University revealed that women were more prone to stress and anxiety [29]. Male and Female medical students did not significantly vary in their stress levels, according to research by Amr *et al.*, from Mansoura University in Egypt [35]. It has been shown in previous epidemiological research that psychological symptoms tend to affect females more than men [30, 31]. This could be because, compared to men in eastern nations, women in the West have less employment possibilities, are more likely to complain excessively about their physical and mental health, and have a heavier workload in school [31]. Exams, interactions with patients, and autopsies are examples of high-stressors that disproportionately affect female students [36]. In contrast, Sarokhani *et al.*, found that 28% of males and 23% of girls suffer from depression [34]. The male doctor population had a greater prevalence of mental health issues than the overall male population, according to Tyssen *et al.*, but the female doctor population had the same high prevalence rates as the overall female population [37]. Gender difference data that doesn't add up is probably due to a complex interplay of biological, social, and other factors [35].

CONCLUSIONS

The findings of our study indicate that university resources and research need to concentrate not just on students' mental health but also, more specifically, on female students. The research found that female students were the most vulnerable to mental health problems among the student groupings examined.

Authors Contribution

Conceptualization: YAJ
Methodology: JAK, IAK, HS
Formal analysis: RK
Writing, review and editing: YAJ, J

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Study of Anatomical Divergences in Facial Artery Endings

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ABSTRACT

Facial artery supplies musculocutaneous tissue, visceral organs, and salivary glands at the upper cervical and facial level. This artery has wide range of anatomical variations in its course. **Objective:** To find the anatomical divergences in facial artery endings. **Methods:** It is a cross sectional study conducted at Jinnah international hospital, Abbottabad from January 2023 to July 2023 for duration of 6 months after taking approval from the ethical review committee. A group of 86 people were selected and anatomical course of facial artery was categorized in to four types. Angiographic images of each participant were evaluated by radiologist to categorize the course of facial artery. **Results:** The average Body Mass Index (BMI) of the participants was 28.3 ± 5.6. The study of angiographic images has concluded that 38.37% (n=33) has Type I course of facial artery, 47.67% (n=41) participants has Type II, 9.3% (n=8) participants has Type III and 4.65% (n=4) has Type IV category (p=0.01. Of the type I category of facial artery, 5 (15.2%) participants met the criteria of type IA, 7(21.2%) has Type IB and 21(63.6%) participants Type IC course of facial artery (p=0.01). **Conclusions:** This study has concluded that there exists vast variation in the anatomical course of facial artery in local population that streamlines with other studies conducted internationally. Facial artery with a nasal branch with or without alar endings is the most common anatomical variation.

INTRODUCTION

The human face is a complex anatomical area with a vast network of blood vessels that are vital to the tissues' nutrient and oxygenation. Facial artery supplies musculocutaneous tissue, visceral organs, and salivary glands at the upper cervical and facial level [1]. Thomas Turner (1793-1873) laid the scientific foundation for accurate anatomical study of the facial artery, which plays a crucial role in facial anatomy and maxillofacial and vascular surgery [2]. It is crucial to know the details of the branching pattern and variations in termination of the facial artery not only for surgical procedures in cosmetic and reconstructive surgery, but also for understanding the underlying anatomical differences that may impact clinical results [3]. The high changeability in spreading patterns, course, and profundity of facial artery, makes it difficult to ensure wellbeing during negligibly obtrusive injectable systems [4]. Additionally, huge varieties in orientation in fanning and conveyance of facial artery, interregional differences in distance across and thickness likewise exists that ought to likewise be considered [5]. Physical studies investigating the varieties in the endings of the facial artery have been reported in the clinical writing, but with differing accentuation and approaches. In the ordinary pattern, the facial artery ends by bifurcating into the unrivaled and sub-par labial corridors. The prevalent labial artery supplies the upper lip, while the sub-par labial artery gives blood to the lower lip. Nonetheless, in certain occurrences, the facial artery end can appear as an

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unrivaled labial artery with a little parallel nasal artery branch, and a pre-masseteric branch with little branches starting from the infraorbital artery [6]. Varieties might happen in the fanning pattern of the facial artery as it moves toward the lips. Rather than bifurcating straightforwardly into predominant and mediocre labial veins, the facial artery might radiate extra branches or gap into numerous more modest vessels prior to arriving at its last objective. Studies have uncovered that Facial artery ends most often as the precise artery with a prevalence of 82%. Different variations of facial artery incorporate horizontal nasal artery that has a prevalence of 12%, unrivaled labial and alar artery with a prevalence of 3% of cases each, and pre masseteric in 18% of the cases [7]. These accessory arteries can contribute to the blood supply of adjacent structures in the facial region, such as the muscles, skin, or glands. Studies have found three pre-masseteic branches of the facial artery were observed in an elderly male cadaver [8]. There also exits unilateral variation in the anatomy and course of facial artery. A case report has revealed that the right facial artery can have an anomalous course through the submandibular salivary gland and form a redundant loop at the base of the mandible, potentially impacting upper neck and face surgeries [9]. In some cases, the facial artery may exhibit anomalous connections or communications with other arteries in the facial region. These anomalous connections can alter the normal distribution of blood flow and may have clinical implications in certain medical procedures or pathological conditions. A unique anastomosis exists between facial and inferior alveolar arteries, providing valuable information for oral and maxillofacial surgeons and dentists performing inferior alveolar nerve blocks [10]. While the facial artery primarily arises from the ECA, collateral connections between the branches of the ECA and ICA can occur. These connections, known as the “rete mirabile” or "wonderful network," may provide alternative pathways for blood flow to the facial region, particularly in cases of vascular pathology affecting the ECA or its branches [11].

METHODS

It is a cross sectional study conducted at Jinnah international hospital, Abbottabad from January 2023 to July 2023 for duration of 6 months after taking approval from the ethical review committee of women medical and dental college Abbottabad Ref No: WMC Estb/19993 on date 24/10/2022. Patients with age 21 years or older, both male and female, with no known vascular abnormalities or facial deformities that could significantly alter the normal anatomy of the facial artery were included in this study. Patients with a history of vascular diseases such as arterial aneurysms, arteriovenous malformations, or arterial stenosis and congenital or acquired facial deformities, such as craniofacial syndromes or significant trauma, were excluded from this study. A total of 132 participants were screened and after evaluation 86 patients full filled the designed criteria and they were included in this study. Assuming the total participant as the population of the study, while using 95% confidence level, 5% margin of error and 80% prevalence the final sample size was 86. The selected sample was provided detailed information about the steps and procedure involved in this study including potential risk and benefits and informed consent was taken. Complete bio data and clinical information of the patients including age, gender, ethnicity, socioeconomic status, clinical presentation and duration of symptoms were noted. Vital signs including blood pressure, pulse and temperature of every participant were noted. Functionality and calibration of the equipment was verified before the procedure. The angiographic images were acquired using fluoroscopy and Digital Subtraction Angiography (DSA) techniques. Multiple images from various angles were collected to visualize the course and branching patterns of the facial artery. The angiographic images were systematically analyzed by two radiologists to identify the divergences in facial artery endings. The anatomy of the facial artery among patients undergoing unilateral carotid angiography was assessed including effective assessment for congenital anomalies, cerebral vascular related malformations, and intra-arterial procedures, including brain cerebral artery aneurysm coil embolization, and tumor embolization, carotid artery stent graft, and cerebral artery thrombolysis. Data were entered and analyzed to identify patterns, variations, and correlations in facial artery anatomy among participants using SPSS version 24.0. It was presented as mean, standard deviation, and percentages. p-values of ≤0.05 will be considered statistically significant.

RESULTS

Data were collected from 86 patients and the mean age was 49.2±5.4 years. The majority of participants were male (58.14%) while females constituted the remaining 41.86%. The average Body Mass Index (BMI) of the participants was 28.3±5.6. Diabetes was present in 38.37% of individuals and 36.04% of participants reported a diagnosis of hypertension.

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Table 1: Demographic Characteristics of Study Sample (n=86)

Variable	N (%)
Age (years)	
Mean ± SD	49.2 ± 5.4
Gender N (%)	
Male	50 (58.14 %)
Female	36 (41.86 %)
BMI (mean ± SD)	28.3 ± 5.6
Diabetes	33 (38.37%)
Hypertension	31 (36.04%)
History of Smoking	37 (43.02%)

In table 2 the study of angiographic images has concluded that 38.37% (n=33) has Type I course of facial artery which is characterized by a facial artery that has an angular branch. This angular branch terminates in the midline taking different course around the orbit. The results have also shown that 47.67% (n=41) participants has Type II course of facial artery. In this cohort, facial artery gives its branch called lateral nasal artery which terminated with or without alar branch. This was followed by third category of facial artery which was found in 9.3% (n=8) participants (p=0.01). The fourth category of facial artery was found in 4.65% (n=4) participants with inferior labial artery as the final arterial ending.

Table 2: Outcomes of the Study

Variables	Type I N (%)			Type II	Type III	Type IV
	33 (38.37%)					
	Type IA	Type IB	Type IC			
Results	5 (15.2%)	7 (21.2%)	21 (63.6%)	41 (47.67%)	8 (9.3%)	4 (4.65%)

DISCUSSION

The rise in aesthetic operations in recent years has resulted in an alarming rise in complications related to arterial artery and branch damage. With more people turning to cosmetic modifications to get desired aesthetic results, procedures like botulinum toxin injections, dermal fillers, and other face rejuvenation methods have become standard [12]. A case that highlights the potential dangers of blood vessel injury during corrective treatments is the facial artery, which is a huge vein that provisions the facial elements. Keeping up with blood flow to the nose, lips, and cheeks, among other face areas, is significantly subject to this artery and its branches [13]. Serious results might happen assuming the facial artery is harmed. An infusion into the facial artery or in nearness to it, for instance, may bring about vascular impediment, which compromises blood flow to the encompassing tissues [14]. Vascular trade off can impact a patient's quality of life and need costly healing measures on the off chance that it brings about tissue misfortune, scarring, and practical disability [15]. Moreover, issues like tissue putrefaction might carve out opportunity to show up, making harm to artery structures after superficial tasks more subtle from the beginning. Hence, to limit negative results and stay away from long haul outcomes, early location and timely treatment of vascular issues are fundamental [16]. To address these worries, healthcare providers carrying out superficial methodology should have a complete comprehension of facial anatomy, particularly the vascular designs, and exercise intense watchfulness to limit the risk of blood vessel injury [17]. Despite the large number of prior studies on the morphology, locations, and courses of the facial arteries, the findings have been quite inconsistent, and there hasn't been any agreement among researchers. Moreover, some past studies have been constrained since they concentrated on cadaveric research [18, 19]. There are also vast inconsistencies present in the outcomes of the present literature further stressing the exhaustive inquiry on the deviations in the course of facial artery. An American study examining the deviations in facial artery by using facial computed tomographic angiography has revealed that in 34% of cases facial artery terminates as Type I, 40% participants has Type II categorization while 24% has shown Type III categorization. Type IV was found in only 2% of the cases [20]. The findings of the above study are consistent with the outcome of this study which increases its credibility.

CONCLUSIONS

This study has concluded that there exists vast variation in the anatomical course of facial artery in local population that streamlines with other studies conducted internationally. Facial artery with a nasal branch with our without alar endings is the most common anatomical variation. Facial artery with inferior labial artery as the terminal branch is the least common anatomical variation in the study population

Authors Contribution

Conceptualization: AH
Methodology: SJ[1], SJ[2]
Formal analysis: MSK
Writing, review and editing: HI, RS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

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Original Article

Immunohistochemical (IHC) Expression of p16 in Various Grades of Oral Squamous Cell Carcinoma (OSCC) with Snuff Use in Tertiary Care Hospitals of Peshawar

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ABSTRACT

Oral squamous cell carcinoma (OSCC) is a significant health concern, with various factors influencing its development and progression. Understanding these factors, including p16 expression and clinicopathologic features, is crucial for improved diagnosis and treatment. **Objective:** To compare various grades of OSCC based on immunohistochemical expression of p16 and clinicopathologic parameters. **Methods:** The comparative cross-sectional study was conducted at the Department of Pathology, Peshawar Medical College (PMC), and Peshawar Dental College (PDC) from August 2020 to August 2021. It included 53 cases of OSCC with documented snuff use history. Tumor sections were stained with Hematoxylin and Eosin and underwent immunohistochemical staining for p16 expression. Sample size calculation utilized G Power software. Statistical analysis was performed using SPSS version 20.0, employing the Chi-Square test to assess categorical variables. **Results:** Among the 53 OSCC cases, the majority were male (66.0%) with ages ranging from 26 to 85 years, the most common age group being 51-70 years. The tongue was the primary site for OSCC development. Well-differentiated cases were predominant (64.2%), followed by moderate (20.8%) and poor grade cases (15.1%). However, no significant association was found between p16 expression and OSCC grades. Notably, p16 expression tended to be higher in snuff users and well-differentiated OSCC cases, although not statistically significant. **Conclusions:** Well-differentiated OSCC cases exhibited the highest expression of p16, followed by moderate and poorly differentiated cases. However, no significant correlation was observed between p16 expression and OSCC in snuff users.

INTRODUCTION

According to GLOBOCAN estimates from 2020, Head and Neck Squamous Cell Carcinoma (HNSCC) ranks as the seventh most common cancer globally. These estimates also indicate that HNSCC leads to approximately 450,000 deaths annually, accounting for roughly 4.6% of all cancer-related deaths worldwide [1]. Additionally, there are around 890,000 new cases of HNSCC diagnosed each year, constituting about 4.5% of all cancer diagnoses worldwide. Oral cancer represents a substantial burden of morbidity and mortality, particularly prevalent in Central and Eastern Europe, Melanesia, and South Asia [2]. As of 2018, the incidence, prevalence, and distribution of oral cancer vary significantly across regions worldwide. Notably, the ten most populous countries globally China, India, the United States, Indonesia, Brazil, Pakistan, Bangladesh, Russia, Japan, and Mexico are dispersed across Asia, North America, South America, and Europe, collectively comprising 56.3% of the total world population. Among these nations, India, Pakistan, and Bangladesh are particularly affected by oral cancer, reflecting significant health challenges within these regions [3]. Research reported in Karachi revealed that OSCC accounted for 8.8% of all cancers in that region. Despite advancements in cancer diagnosis and treatment over the last three decades, the overall 5-year survival rate for OSCC remains notably low, consistently falling below 50% [4]. Globally,

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Oral squamous cell carcinoma (OSSC) is more common in men's than in women that is 2:1[5]. OSCC was believed to be more prevalent in individuals aged 60 to 80 years. OSCC can manifest in various areas of the "oral cavity" including the, tongue, mucosa of the buccal area, palate, floor of the mouth, lip, and even the gingiva. Globally, the tongue is the commonest site for OSCC, while in South Asia, particularly, the mucosa of buccal area is more frequently affected [6]. Nicotine use, chewing of pan, and prolonged exposure to sun are frequently cited as common etiological factors for OSCC. In addition to these, both smokeless tobacco (snuff) and Human Papillomavirus (HPV) have been identified as factors that elevate the risk of developing OSCC [7,8]. The direct contact of snuff with the oral mucosa induces keratinization of the oral epithelium. This keratinized epithelium sets the stage for premalignant lesions through various signaling pathways, ultimately progressing to malignancy [9]. Snuff exerts a dual impact by suppressing and inflaming immune cells, thereby fostering autoimmunity. These effects collectively contribute to the development of oral malignancies [10]. The expression of HPV genes can be influenced by certain environmental chemical compounds. A noteworthy correlation exists between HPV and tobacco-related carcinogens, particularly in the context of oral cancer [11]. Two specific carcinogens present in snuff, namely nitrosamines and nitroguanosine, induce a tumor phenotype in primary oral keratinocytes that have been immortalized with HPV. Benzo[α] pyrene (BaP), another carcinogen found in snuff, leads to a tenfold increase in HPV titers. Additionally, snuff exhibits an immunosuppressive effect against HPV [12]. In the pathogenesis of OSCC, high-risk HPV types such as HPV16 and 18 play a significant role, as highlighted by Khokhar *et al* [13]. It's noteworthy that "patients with HPV-associated OSCC" tend to have a prognosis that is 90% more favorable compared to those without HPV-associated OSCC. The development of HPV-associated oral squamous cell carcinoma (OSCC) encompasses a diverse array of genetic mutations, deletions, and translocations. Notably, prominent among these alterations are p16, p53, cyclin D1, p63, PTEN, Rb, and the Epidermal Growth Factor Receptor [14]. While the primary role of p16 is to hinder the tumor process, gene mutations can contribute to the onset of OSCC. As such, p16 holds promise as a potential biomarker for predicting high-risk HPV-associated OSCC [15]. In normal cells, p16 is expressed at low levels, making it nearly undetectable through immunohistochemistry (IHC) [16]. However, due to the transformative activity of the E7 genes, p16 exhibits high expression in tumor cells infected by HPV, facilitating its easy detection. Consequently, there exists a close association between p16 expression and HPV positivity [17].

The aim of study was to find out p16 expression in OSCC in snuff users, since the snuff affects the immune system adversely, which makes patients an easy target for viral infection.

METHODS

This cross-sectional study with a descriptive design was conducted at the Department of Pathology, Peshawar Medical and Dental College in Peshawar. The study spanned a period of one year from August 2020 to August 2021. The sample size has been calculated by using the G power software with (3.5%) prevalence of oral squamous cell carcinoma in KP. Employing a one-tailed test with an effect size of 0.5, an α value of 0.05 (indicating the margin of type 1 error), and a power of 80% (with a minimum acceptable probability for type 2 error set at 20%). Statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 20.0. Categorical variables were assessed using the Chi-Square test. "The sample size was determined using G Power software version (3.1.9.7) with an effect size of 0.5, alpha set at 0.05, power at 80%, and a degree of freedom of 2%". Sampling for this study was performed using a nonprobability convenient sampling technique. The ethical guidelines were followed and approval was received from the "Institutional Review Board (IRB)" in Peshawar, with the assigned approval number being "Prime/IRB/2020/235". The study included 53 previously diagnosed cases of oral squamous cell carcinoma (OSCC). Exclusions comprised cases with poor formalin fixation, which may lead to antigen retrieval issues, and blocks from patients undergoing chemotherapy. Cases with accessible historical records were collected from the "Department of Pathology" at "Peshawar Medical College (PMC)" and the Department of Surgery at "Peshawar Dental College and Hospital (PDC)". Immunohistochemical staining was performed at the "Department of Pathology, Peshawar Medical College, Riphah International University" laboratory, while all other laboratory procedures were conducted at the Department of Histopathology, Peshawar Medical College. Tissue blocks embedded in paraffin and treated with formalin from previously diagnosed cases of oral OSCC. Sections were cut from these blocks for both Hematoxylin and Eosin (H&E) staining and immunohistochemistry (IHC) procedures. Thin sections, measuring 4 to 5 µm of the OSCC with paraffin embedded tissue were subjected to H&E staining following standard protocols. The diagnosis of oral cancer and immunohistochemistry staining with (p16) antibody involved microscopic examination of Hematoxylin and Eosin (H&E) slides. The interpretation of p16 expression was conducted manually, involving several steps. First, the World Health Organization (WHO) guideline for histopathological grading of OSCC was utilized, categorizing OSCC into three grades: well-differentiated (Grade 1), moderately differentiated (Grade 2), and poorly

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differentiated (Grade 3). Next, scoring of p16 intensity was based on the observed staining, with a scale of 1 to 3 indicating weak, moderate, and strong expression, respectively. Additionally, the percentage of stained cells was assessed, score 0: No staining, score 1: 0-10% of cells stained, score 2: 11-50% of cells stained, score 3: 51-80% of cells stained, score 4: 81-100% of cells stained. The assessment considered the intensity and percentage of brown staining of cells (cytoplasmic and nuclear staining) under microscopic examination, with stronger intensity indicating higher p16 expression and weaker intensity suggesting lower expression. At last, the p16 end score, ranging from 0 to 12, was derived by multiplying the intensity and percentage of stained cells (intensity of stained cell x percentage of stained cells). A score of 4 or higher indicated positive p16 expression.

The method of indirect immunohistochemistry was used. Tissues fixed in formalin and embedded in paraffin were subjected to deparaffinization. The retrieval of antigens was achieved by immersing the sample in a citrate buffer solution, followed by heating in an oven at 95-100 degree Celsius for a duration of 20 minutes. The slides were permitted to cool at room temperature for a period of 15 to 20 minutes. Slides were rinsed using a phosphate-buffered saline (PBS) and distilled water. The sections of the slides were treated with a peroxidase blocking solution (PBS) and incubated at room temperature for a duration of 10 minutes. After rinsing the slide in Phosphate Buffer Solution for 6 minutes, the chromogen substrate was applied to reveal the color of the antibody. Subsequently, the slides were incubated in a peroxidase substrate solution. Following a color development time of less than 5 minutes, the slides were cleaned. Next, the slides were submerged in Hematoxylin counterstaining solution for a period of 1-2 minutes. and further cleaned for 15 minutes under running tap water. Tissue slides were dehydrated using alcohol for 5 minutes. The final steps involved cleaning the slides with 3 changes of xylene, applying a cover slip with a mount solution and storing the slides at room temperature.

In this comparative cross-sectional study, data analysis was conducted using SPSS software (version 25.0). For categorical data, including parameters such as p16 expression and gender, frequency and percentages were determined. Chi-square tests were utilized to analyze categorical data, with a significance level set at a P-value less than or equal 0.05. This approach allowed for the comparison of variables among the three categories of OSCC.

RESULTS

The demographic and disease history of patients with OSCC were of total 53 cases of OSCC, majority patients were males (n=35, 66.0%), and the overall age range spanned from 26 to 85 years, with the most common age range being 61-70. The predominant site of OSCC development was the tongue, followed by the buccal mucosa. The majority of OSCC cases (n = 34, 64.2%) had well-differentiated histopathological grades, followed by cases that were moderately differentiated (n = 11, 20.8%) and poorly differentiated (n = 8, 15.1%), a majority of individuals with a history of snuff use exhibited p16 positivity as outlined in (table 1).

Table 1: Basic Demographics and Disease History of Patients with OSCC

Variable	Male				Female				
OSCC in Snuff Users	35 (66.0%)				18 (34.0%)				
	Age Range								
	21-30	**31-40**	**41-50**		**51-60**	**61-70**	**71-80**	**81-90**	
	2 (3.8%)	2 (3.8%)	9 (17.0%)		14 (26.4%)	16 (30.2%)	7 (13.2%)	3 (5.7%)	
	Location of lesion								
	Tongue	**Buccal Area**	**Cheek**	**Oropharynx**	**Bone**	**Maxilla**	**Lip**	**Oral Cavity**	**Mandible**
	16 (30.2%)	13 (24.5%)	2 (3.8%)	9 (17.0%)	3 (5.7%)	1 (1.9%)	3 (5.7%)	3 (5.7%)	3 (5.7%)
	Well Differentiated OSCC			**Moderately Differentiated OSCC**			**Poorly Differentiated OSCC**		
	34 (64.2%)			11 (20.8%)			8 (15.1%)		
	Expression of p16 in OSCC								
	Negative				**Positive**				
	2 (3.77%)				51 (9.22%)				

In the 53 cases with a history of snuff usage, no significant associations were observed between gender, age, the site of OSCC lesions, and the different grades of OSCC with expression of p16 across. The calculated p-value exceeded 0.05, as indicated in Table 2A, Table 2B, Table 2C and Table 2D. The study included a total of 53 patients diagnosed with Oral Squamous Cell Carcinoma (OSCC), among whom a significant majority were male (66.0%). Notably, the age group most commonly affected was 61-70 years. Upon analysis of lesion sites, the tongue emerged as the predominant location, accounting for 30.2% of cases. Histological grading revealed that well-differentiated OSCC was the most prevalent,

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comprising 64.2% of cases. Moreover, all patients showed positive expression of p16 within the OSCC samples. These findings shed light on the demographic profile and disease characteristics of OSCC patients within the study, emphasizing the predominance of males, older age groups, and the consistent presence of p16 expression.

Table 2A: Relation of p16 Expression in OSCC Cases with Gender of the Patients

Gender	n (%)	p16 Expression		p-Value
		Positive	Negative	
Male	35 (66.0%)	33 (66.2%)	2 (3.7%)	0.3
Female	18 (33.9%)	18 (33.9%)	0 (0%)	
Total	53 (100%)	51 (96.2%)	2 (3.7%)	

Table 2B: Age Distribution of OSCC Cases with p16 Expression

Age	n (%)	p16 Expression		p-Value
		Positive	Negative	
21-30 Years	2 (3.7%)	2	0	0.11
31-40 Years	2 (3.7%)	2	0	
41-50 Years	9 (16.9%)	8	1	
51-60 Years	14 (26.4%)	14	0	
61-70 Years	16 (30.1%)	16	0	
71-80 Years	7 (13.2%)	7	0	
81-90 Years	3 (5.6%)	2	1	
Total	53 (100%)	51 (96.2%)	2 (3.7%)	

Table 2C: Relation of p16 Expression with Site Involved in OSCC Cases

Site of the Lesion	n (%)	p16 Expression		p-Value
		Positive	Negative	
Tongue	16 (30.1%)	16 (30.1%)	0 (0%)	0.9
Buccal Mucosa	13 (24.5%)	12 (22.6%)	1 (1.8%)	
Cheek	2 (3.7%)	2 (3.7%)	0 (0%)	
Oropharynx	9 (16.9%)	8(15%)	1 (1.8%)	
Bone	3 (5.6%)	3 (5.6%)	0 (0%)	
Maxilla	1 (1.8%)	1 (1.8%)	0 (0%)	
Mandible	3 (5.6%)	3(5.6%)	0 (0%)	
Lip	3 (5.6%)	3 (5.6%)	0 (0%)	
Oral Cavity	3 (5.6%)	3 (5.6%)	0 (0%)	
Total	53 (100%)	51 (96.2%)	2 (3.7%)	

Table 2D: Comparison of p16 Expression in OSCC Cases with Grades of OSCC

Grades	n (%)	p16 Expression		p-Value
		Positive	Negative	
Well Differentiated	34 (64.1%)	32 (60.3%)	2(3.7%)	0.5
Moderately Differentiated	11 (20.7%)	11 (20.7%)	0 (0 %)	
Poorly Differentiated	8 (15.0%)	8 (15.0%)	0 (0%)	
Total	53 (100%)	51 (96.2%)	9 (16.9%)	

Figure 1 (A) shows the H&E staining of 40x demonstrating well differentiated OSCC in snuff users While in figure 1 (B), immunohistochemistry p16 was applied. Expression of p16 stains (brown color staining) was strong positive in snuff users of OSCC. (black arrows). Majority of cells were brown stain which meant that well differentiated OSCC was positive for p16.

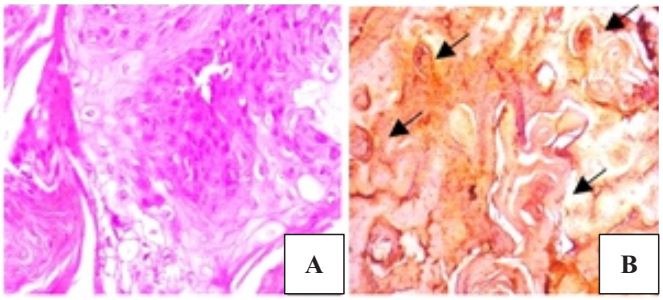

Figure 1: (A) H&E Staining of 40x, Well Differentiated OSCC; **(B)** Positive Expression of p16 Stains

Figure 2 (A) shows the H&E staining of 40x demonstrating the poorly differentiated OSCC in snuff users, while in figure 2 (B) immunohistochemistry p16 was applied. Expression of p16 stains (brown color staining, black arrows) was weak positive in snuff users of OSCC. Blue arrows show negative staining of cells in snuff users of OSCC.

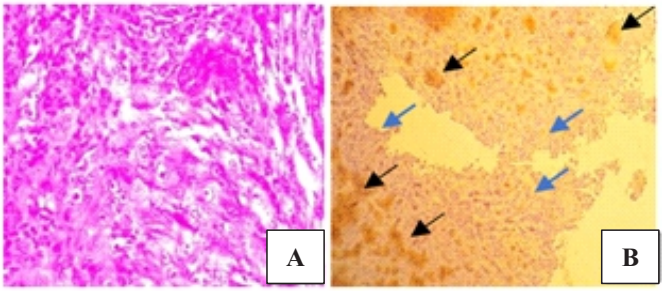

Figure 2: A) H&E Staining of 40x Poorly Differentiated OSCC; **(B)** Weak Expression of p16 Stains

DISCUSSION

Based on our results, the prevalent location for OSCC was the tongue. This aligns with the findings of a study conducted by Yosefof *et al.*, which also identified the tongue as the most frequent site for the development of OSCC [18]. The findings of investigation conducted by Ehtesham *et al.*, revealed that oral squamous cell carcinoma (OSCC) predominantly in males, involveed the floor of the mouth and the boundary of the tongue. Conversely, the anatomical region most frequently affected in females was found to be the buccal sulcus [19]. In contrast, Anwar *et al.*, showed that oral squamous cell carcinoma (OSCC) exhibited a prevalence twice as high in the buccal mucosa, accounting for 68.8% of cases [20]. Likewise, investigations carried out in 2018 by Mehdi *et al.*, and in 2019 by Akram *et al.*, reported that the buccal mucosa stood out as the most frequently involved site in individuals with oral cancers [21, 22]. In our research, the predominant observation was that most of the cases showed well differentiation, which was followed by moderate and poor differentiated cases. Consistent with our investigation Sarfaraz *et al.*, in 2020 reported that well-differentiated cases were the most commonly observed grade in oral squamous cell carcinoma (OSCC) cases [23]. Contrary to our findings, a study in 2019, Mehdi *et al.*, from Pakistan found an equal number of moderate and poor grade cases

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(n=16, 34%), with a slightly lower number (n=15, 32%) of well-differentiated cases [24]. Study from Pakistan Rehman *et al.*, similarly demonstrated that moderately differentiated cases were the most prevalent grade for oral squamous cell carcinoma (OSCC) [25]. Among the 53 participants, the majority of males (n=35) were identified as snuff users. On the contrary, among the total participants, 18 females were identified as snuff users. Our study's findings are consistent with those of Radika *et al.*, where they reported that 8% of men and 5% of women were users of snuff [26]. A majority of patients with a history of snuff use in our study exhibited well-differentiated OSCC (33%). In contrast, Sinha *et al.*, reported that females with lower education levels and from low socio-economic status backgrounds were more likely to use snuff [27]. In our research, a predominant occurrence of p16 positivity was noted in well-differentiated OSCC cases, followed by moderately differentiated and poorly differentiated OSCC cases. However, no statistically significant association was found between p16 expression and the grades of OSCC. These findings align with a study reported Agarwal *et al.*, which similarly reported p16 expression and OSCC grade levels do not significantly correlate [28]. In contrast to our findings, the majority of OSCC cases with p16 positive were moderate grade (79.5%), followed by well and poor grade OSCC, according to a study conducted by Naz *et al* [29]. The observed differences in findings might be attributed to the methodology employed by Naz *et al.*, who conducted PCR on all participants' samples and subsequently selected only those that were HPV positive. Additionally, variations in results could be influenced by differences in sample sizes between the two studies. In our study, a notable association was observed between the history of snuff use and p16 expression, indicating that snuff users exhibited higher p16 expression. This correlation may be attributed to the adverse effects of snuff on the immune system, rendering patients more susceptible to viral infections. The outcomes of our study align with those reported by Naz *et al.*, and Aguayo *et al.*, as both studies demonstrated no significant association between snuff use and the p16 expression [29, 30]. The findings of Trinh *et al.*, in 2021 from France further support our results, as they similarly demonstrated no statistical significance for snuff use and p16 positivity [31]. Contrary to our findings, Agarwal *et al.*, in 2021 reported a statistical significance for snuff use and the expression of p16, with a p-value of 0.012 [28]. Similarly, a study revealed a statistical significance for snuff use and the positivity of p16 [32].

CONCLUSIONS

In OSCC, majority of males uses snuff with most frequent site involved was tongue. The oral squamous cell carcinoma (OSCC) cases that were well-differentiated exhibited the highest expression of p16, followed by moderate and poorly differentiated OSCC cases. However, no significant association was observed between p16 expression and OSCC in snuff users.

Authors Contribution

Conceptualization: KA
Methodology: KA, NK, RA, SY
Formal analysis: SA, SN
Writing-review and editing: KA, NK

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Microdebrider Assisted Endoscopic versus Conventional Sinus Surgery in Sinonasal Polyposis: A Comparative Study

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ABSTRACT

For sinonasal polyposis, functional endoscopic sinus surgery or conventional is the standard surgical approach. Microdebrider assisted endoscopic sinus surgery provides patients with a better therapeutic approach. **Objective:** To assess and compare intraoperative, loss of smell, synechiae formation and polyp recurrence between microdebrider and conventional method in nasal polyposis patients. **Methods:** Cohort Study was carried out in Department of Ear Nose Throat, Shaikh Zayed Hospital, Lahore, 2022-2023. A total of sixty individuals with sinonasal polyposis, presenting in both genders, were included. Once written consent was obtained, the patient's comprehensive demographics were documented. Every patient was split evenly into two groups. Thirty patients each from Group A and Group B underwent endoscopic sinus surgery using traditional endoscopic tools and microdebrider respectively. Results were compared between the two groups in terms of synechiae production, length of operation, postoperative crusting, loss of smell, and intraoperative blood loss. **Results:** Age and gender differences between the two groups were not statistically significant (p-value >0.05). Regarding synechiae and loss of scent, there was no discernible difference between the two groups. **Conclusions:** The endoscopic sinus surgery with microdebrider was more effective for sinonasal polyposis as compared to conventional procedure.

INTRODUCTION

Nasal polyposis is characterized by inflammatory or viral lesions affecting the nasal or paranasal sinuses, presenting initially as smooth, round, semi-translucent masses primarily in the middle and ethmoid meatus. It impacts approximately 1 to 4 percent of the population [1]. Despite its prevalence, studies investigating variables influencing surgical outcomes have often been of low quality, resulting in varying complication rates ranging from 0.3% to 22.4%, with major complications including meningitis, brain fluid leakage, and carotid artery injuries [2].The management of nasal polyposis often involves surgical intervention, with functional endoscopic sinus surgery (FESS) being a widely used procedure. FESS has shown symptomatic improvement rates ranging from 78% to 88%, surpassing those of comparable procedures (citation needed). But issues like bleeding, infection, crusting, loss of smell, and polyp recurrence still need to be addressed [3].A fresh method for FESS has been established with the introduction of microdebrider-assisted surgery. Research contrasting mechanical

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debriders with conventional instruments has demonstrated similar results in terms of ostial patency and synechiae development, with the added benefit of simpler waste handling[4-7].

The current study intended to assess the extra advantages of microdebriders in the local population's FESS for nasal polyposis.

METHODS

A prospective cohort design was used in this study in order to compare the results of traditional sinus surgery with microdebrider-assisted endoscopic sinus surgery in patients with sinonasal polyposis. The study was conducted at the Department of ENT, Shaikh Zayed Hospital, Lahore over the course of one year. The study was approved by Institutional review board of Shaikh Zayed Medical complex with IRB ID SZMC/IRB/Internal/MS/123/19, dated 19-12-2019. A sample of 60 patients was considered, with 80% power of test and 95% level of confidence. The expected mean intra-operative blood loss in patients undergoing functional endoscopic sinus surgery for nasal polyposis with and without microdebrider assistance was estimated to be 81.90±7.26 ml (microdebrider) versus 109.93±6.20 ml (conventional). Non-probability consecutive sampling technique was employed for participant selection, after the consecutive sampling final sample size was achieved. Inclusion criteria include, Patients of both sexes, aged between 20 and 70 years, suffering from nasal polyps as per operational definition, Patients with a Lund-Mackay score >8, Patients who provided written informed consent. Exclusion criteria includes, patients taking antiplatelet therapy or having bleeding disorders, patients who had undergone radiotherapy for oral or pharyngeal tumors in the past month, patients with a history of previous nasal surgery, patients with sinonasal polyposis due to etiologies other than allergic, such as fungal sinusitis, patients requiring other surgeries like septoplasty, Hypertensive patients. Following clearance by the Hospital Ethical Review Committee, eligible patients were told about the study and granted written informed consent. Using a lottery, patients were divided into two groups. Group A had endoscopic sinus surgery with microdebrider assistance, whereas Group B had traditional endoscopic sinus surgery. Surgical procedure was performed, by same Surgeon. Under general anesthesia, an endoscope was inserted into the nose to visualize the polyps and nasal anatomy. Polyp resection was performed using traditional methods in Group B and with the assistance of microdebriders in Group A. Blood loss and surgical time were recorded during the procedure. Patients were managed with appropriate antibiotics and painkillers post-operatively. Follow-up appointments were scheduled at 24 hours for packing removal and at 6 months for further evaluation. The outcome of interest included smell loss, synechia formation, nasal crusting and intraoperational blood pressure, number of follow ups, the need for second operation to eliminate synechia and recurrence and cost of treatment. Data analysis was performed using SPSS version 21.0. Quantitative variables such as intraoperative blood loss and surgical time were presented as mean±SD, while qualitative variables such as gender, crusting, synechiae formation, recurrence, and smell loss were presented as frequency and percentages. Statistical significance was assessed using independent t-tests and chi-square tests, with $p \leq 0.05$ considered significant.

RESULTS

The demographic distribution revealed that in group A and B, were 11 (36.7%) males and 19 (63.3%) females, and 12 (40%) males and 18 (60%) females respectively. The male to female ratios were 1:1.7 and 1:1.5 respectively. Group A had mean age of 37.20±11.55 years. Group B had a mean age of 38.27±11.35 years. The difference in age distribution between the groups was not significant ($p>0.05$) shown in table 1.

Table 1: Demographic Characteristics

Variables	Group A	Group B	p-value
Gender			
Male	11 (36.7%)	12 (40%)	0.68
Female	19 (63.3%)	18 (60%)	
Age			
21-40 years	18 (60%)	17 (56.7%)	0.720
41-60 years	12 (40%)	13 (43.3%)	

The comparison between patients undergoing microdebrider-assisted (Group A) and conventional (Group B) sinus surgery revealed significant differences in several outcome measures. Group A exhibited a higher no of crusting in relation to Group B, with 8 patients (26.7%) experiencing crusting in Group A compared to only 2 patients (6.7%) in Group B ($p = 0.038$*). However, there was no discernible difference in the two groups' incidence of synechiae formation ($p = 0.228$*), with 2 patients (6.7%) and 5 patients (16.7%) in Group B and Group A, respectively, having synechiae. Similarly, while there was a trend towards fewer instances of polyp recurrence in Group B (1 patient, 3.3%) compared to Group A (5 patients, 16.7%), ($p = 0.085$). Loss of smell was reported in 2 patients (6.7%) in Group A, while no patients in Group B experienced this outcome, ($p = 0.150$). Significantly less blood was lost during surgery in Group B than in Group A, where all 30 patients (100%) lost blood between 96 and 130 ml ($p = 0.00$*). Of the patients in Group B, 28 (93.3%) lost blood between 65 and 95 ml. Furthermore, the procedure duration was significantly shorter in Group B, with 27 patients (90%)

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having operative times between 1.0-2.59 hours and only 3 patients (10%) between 3.0-4.0 hours, compared to Group A where 17 patients (56.7%) had operative times between 1.0-2.59 hours and 13 patients (43.3%) between 3.0-4.0 hours (p = 0.00*) as explained in table 2.

Table 2: Outcome Variable Group A versus B

Variable	Group A (Microdebrider Assisted)	Group B (Conventional)	p-value
Crusting	8 (26.7%)	2 (6.7%)	0.038*
Loss of smell	2 (6.7%)	-	0.150
Intraoperative blood loss (ml)			
65-95	-	28 (93.3%)	0.00*
96-130	30 (100%)	2 (6.7%)	
Procedure duration (hours)			
1.0-2.59	17 (56.7%)	27 (90%)	0.00*
3.0-4.0	13 (43.3%)	3 (10%)	

*p<0.05

DISCUSSION

The necessity for definitive surgery in patients with nasal polyposis, who have not responded to conservative treatment, underscores the importance of achieving adequate ventilation and drainage of infected sinuses. Maintaining mucosal integrity or eliminating pathological changes is crucial for effective sinus drainage and tissue regeneration, typically occurring over a period of six months [8]. Microdebriders offer a precise and controlled means of tissue resection, reducing the risk of inadvertent damage and postoperative complications compared to conventional endonasal forceps, which may cause excessive trauma by removing normal mucosa and bone exposure [9]. The percentage of female patients (61.67%) is higher than that of male patients (38.33%), and the majority of patients are between the ages of 21 and 40. This distribution of gender is consistent with study from other authors measuring the outcomes of functional endoscopic sinus surgery (FESS) [10]. Compared to the traditional group, the microdebrider-assisted group had a positively higher rate of polyp recurrence in ($p<0.05$) and a significantly bigger intraoperative blood loss ($p<0.05$). These findings are in accordance with a study conducted by Varman *et al.*, which discovered that the conventional group's rates of scarring, synechiae formation, and polyp recurrence were much greater [11]. Synechiae is a common consequence of endoscopic sinus surgery. The use of microdebriders can help lowering the synechie. In contrast to the traditional group, a greater percentage of patients in the microdebrider group attained full nasal patency, and there was a statistically significant improvement in scent perceptions (P=0.000) in the microdebrider group, according to Salam et al [12]. Another research found that microdebriders are associated with less blood loss [13, 14]. These study findings shows the importance of using microdebriders during endoscopic sinus surgery to provide more effective and less traumatic polyp resection. Apart from the above mentioned benefits, microdebriders also offer surgical suction, which makes it easier to remove polypoid tissues from the surgical site without having to take the tool out. This feature improves the process's efficiency and helps with improved sensitivity, visualisation, and fewer operational disruptions [15]. Furthermore, a non-randomized, non-blind research with 250 patients receiving assistance from microdebriders during surgeries revealed that the group using microdebriders had significantly less intraoperative bleeding than the 225 patients receiving conventional endoscopic treatments [16, 17]. In a similar vein, a different study found that, in nasal polyp procedures, microdebriders dramatically shorten operating times and intraoperative blood loss [18, 19]. The current study also revealed notable differences in intraoperative blood loss and operative time between the groups, consistent with findings from a 5-year prospective randomized controlled study by Saafan *et al* and previous investigations conducted at Dokuz Eylu University [14, 20]. However, the study by Selivanova *et al.*, did not find statistically significant differences in surgical outcomes between conventional instruments and mechanical debriders, contrasting with the findings observed in this research [21].

CONCLUSIONS

When compared to traditional endoscopic sinus surgery, microdebriders are more successful because they require less blood and less time for the procedure, have better postoperative endoscopic and symptom scores, and combine suction and cutting into one device for precise tissue removal that doesn't harm the surrounding mucosa. They also leave fewer scars and synechiae and cause fewer complications.

Authors Contribution

Conceptualization: WK
Methodology: AD, SHS, AN
Formal analysis: ZUSQ
Writing-review and editing: SQ

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Characteristics of Bleeding Peptic Ulcers and the Outcome after Endoscopic Therapy at a Tertiary Care Centre of Pakistan

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ABSTRACT

Peptic ulcers are a global health concern. Bleeding episodes, a common complication require urgent intervention. Endoscopic therapy for managing bleeding peptic ulcers offering both diagnostic and therapeutic benefits. **Objective:** To analyze the characteristics of bleeding peptic ulcers and assess the outcomes following endoscopic therapy. **Methods:** A descriptive case series was conducted at Lahore General Hospital (LGH) between June 2021 and January 2022. Patients aged 18-80 with upper GI bleeding due to peptic ulcers or undergoing endoscopy with bleeding peptic ulcers were included. An 80mg bolus of omeprazole was given, followed by infusion at 8mg per hour and an urgent endoscopy was planned. Patients were observed for re-bleeding for 72 hours post-endoscopy. **Results:** Out of total 100 patients with upper GI bleeding, 70% of patients were male and 30% were female. The most common diagnosis was duodenal ulcers (75%), with the anterior wall being the most common site (86.67%). Dual therapy was administered in all patients, with hemostatic clips being applied in 68% of patients and electrocoagulation heat therapy being used in 32% of patients. Initial hemostasis was successful in 88% of patients treated endoscopically. But, 12% of patients experienced heavy bleeding during endotherapy and out of these, 8 patients required urgent laparotomy. Patients needed a second look endoscopy, 4 patients requiring angiographic embolization and 6 being managed with endotherapy. **Conclusions:** Dual therapy, hemostatic clips and electro-coagulation heat therapy are effective in achieving initial hemostasis in most cases.

INTRODUCTION

Approximately 19–57 incidences of bleeding peptic ulcers per 100,000 individuals are thought to occur each year [1]. It is one of the most frequent presentations in emergency rooms throughout the world with considerable morbidity and mortality [1]. Peptic ulcer bleeding accounts for approximately 50% of upper gastrointestinal bleeding cases [2]. The most prevalent causes of peptic ulcers are *Helicobacter pylori* infection and drug use, specifically non-steroidal anti-inflammatory drugs (NSAIDs), antiplatelet medications like aspirin, and anticoagulants. The usage of drugs in combination increases the risk of bleeding from ulcers many fold according to some studies [3, 4]. However, the occurrence of non-*H. pylori* and non-NSAID peptic ulcer disease has decreased recently due to effective management in the diagnosis and treatment of *H. pylori* infection and judicious use of NSAIDs especially in the developed countries [4]. A majority (around 80-85%) of bleeding peptic ulcers stop spontaneously and endoscopy is not needed. However recurrent bleeding has significant mortality that is why antisecretory agents and endoscopic treatment is recommended [2]. Upper GI endoscopy should be performed within 24 hours, ideally within 12 hours in addition to intravenous PPI. The management depends on endoscopic appearance of ulcers, for actively bleeding ulcers dual therapy with epinephrine and bipolar electrocoagulation or hemostatic clips [5]. Rebleeding

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occurs in around 10-30% of patients after successful endoscopic therapy [6]. Several factors are thought to contribute to mortality after therapeutic endoscopy such as advanced age, presence of comorbidities, hemodynamic instability at presentation, continued bleeding and failure of endoscopic therapy resulting in surgical intervention [7].

This study aimed to present an overview of our experience managing bleeding from peptic ulcers, with a focus on the attributes and consequences of gastro duodenal ulcer bleeding related to age, gender, comorbidities, and drug use.

METHODS

A descriptive case series was studied at the Department of Gastroenterology at Postgraduate Medical Institute, Lahore General Hospital Lahore between June 2021 and January 2022 (IRB Reference number 20-22-21, dated 23/09/21). An informed consent was requested from all the patients prior to the data acquisition. Total 100 patients meeting the inclusion criteria were enrolled using convenient sampling method. Sample size was calculated using $n = (z)^2 p (1 - p) / d^2$,Z=1.96 ,p= probable proportion of the population that presents the characteristic [19]. All patients between aged 18 and 80 years, irrespective of both genders, presenting with Upper GI bleeding due to bleeding peptic ulcers, those undergoing endoscopy due to any other indication or bleeding peptic ulcers, and who have had therapy for bleeding peptic ulcers in the past and those admitted in hospital for any other reason and bleeding during hospital stay were included in the study. Patients with clean based ulcers, without any stigmata for recent bleeding, had malignant ulcers, those who were unfit to undergo endoscopy, or were allergic to any drugs used in the study, Pregnant or breast feeding patients were excluded from the study. All patients' demographics were noted. In the patients that presented with upper GI bleeding, Omeprazole was infused continuously at a rate of 8 mg every hour after an 80 mg intravenous bolus and an urgent endoscopy was planned. During endoscopy the ulcer characteristics were noted and a suitable dual therapy was given depending upon the size, location and class of ulcer. Patient was observed for 72 hours post endoscopy for any signs of rebleeding like hematemesis, melena, fall in hemoglobin and hemodynamic instability. A second look endoscopy was performed only if rebleeding was present. Again the characteristics of ulcer was noted and therapy was given. Patients who failed therapy were referred for surgery or radiological intervention.

RESULTS

Out of 100 patients evaluated, 70 (70%) were men and 30 (30%) were women. 90 (90%) patients were admitted through emergency with complaints of upper GI bleeding and 10 (10%) patients were already admitted with other diseases. Out of these 75 (75 %) of patients had duodenal ulcers with the most common site being anterior 60 (86.67%) followed by posterior wall of duodenal cap. 18 (18%) patients had both gastric and duodenal ulcers, while 7(7%) had just both gastric and duodenal ulcers. Using Forrest classification 15 (15%) ulcers belonged to Forrest Ia, 18 (18%) to Ib, 50 (50%) to IIa and 17 (17%) to IIb. Dual therapy was administered in all the patients i.e. following adrenaline injection in all patients. In 68 (68%) patient's hemostatic clips were applied while with adrenaline and in 32 (32%) patients were given electrocoagulation heat therapy with gold probe was used with adrenaline. Out of the 100 patients treated endoscopically in 88 (88%) patients initial hemostasis was successful, 12 (12%) patients started bleeding heavily during endotherapy and 4 out of these 12 (33.3%) could be managed endoscopically and 8 (66.66%) needed urgent laparotomy out of which 5 (62.5%) survived post surgically, 3 (37.5%) patients died because of associated comorbids and septicaemia, 18 patients had rebleeding and 4 (22.22%) patients died before second look endoscopy because of associated comorbids and ischemic heart disease, 14 patients needed second look endoscopy for rebleeding and out of these 14 patients, four patients needed angiographic embolisation and 6 could be managed with endotherapy, four patients died because of cardiovascular events.

Table 1: Sociodemographic and Clinical Profile of Study Participants

Parameters	N (%)
Age (Years)	
18-40	14 (14%)
41-65	38 (38%)
>65	48 (48%)
Etiology of Ulcer	
H.pylori Disease	27 (27%)
NSAIDs Use	18 (18 %)
Low Dose Aspirin	5 (5%)
NSAID + Low Dose Aspirin	13 (13%)
H.pylori disease + NSAIDs	24 (24%)
H.pylori Disease + NSAIDs + Low Dose Aspirin	8 (8%)
Others	5 (5%)
Ulcer Site	
Duodenal	28 (28%)
Gastric	6 (6%)
Gastroduodenal	3 (3%)
Comorbid Illness	
Cardiovascular Disease	6 (6%)
Cerebrovascular Disease	1 (1%)
Pulmonary Disease	2 (2%)
Rheumatological Disease	3 (3%)

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Kidney Failure	6 (6%)
Liver Failure	7 (7%)
Cancer	7 (7%)
Diabetes Mellitus	13 (13%)
Smoking	7 (7%)
NKCM	48 (48%)

In table 2, out of these 75 (75 %) of patients had duodenal ulcers with the most common site being anterior 60 (86.67%) followed by posterior wall of duodenal cap. 18 (18%) patients had both gastric and duodenal ulcers, while 7(7%) had just both gastric and duodenal ulcers. Using Forrest classification 15 (15%) ulcers belonged to Forrest Ia, 18 (18%) to Ib, 50 (50%) to IIa and 17 (17%) to Iib.

Table 2: Etiology of Peptic Ulcer with Respect to Gender

Etiology	Males N (%)	Females N (%)
H.pylori Disease	20 (28.57%)	7 (23.33%)
NSAIDs Use	13 (18.57%)	5 (16.67%)
Low Dose Aspirin	4 (5.71%)	1 (3.33%)
NSAID + Low Dose Aspirin	8 (11.43%)	5 (16.67%)
H.pylori Disease + NSAIDs	16 (22.86%)	8 (26.67%)
H.pylori Disease + NSAIDs + Low Dose Aspirin	5 (7.14%)	3 (10.00%)
Others	4 (5.71%)	1 (3.33%)
Total	70 (70%)	30 (30%)

In Table 3, Out of the 100 patients treated endoscopically in 88 (88%) patients initial hemostasis was successful, 12 (12%) patients started bleeding heavily during endotherapy and 4 out of these 12 (33.3%) could be managed endoscopically and 8 (66.66%) needed urgent laparotomy out of which 5 (62.5%) survived post surgically, 3 (37.5%) patients died because of associated comorbids and septicaemia, 18 patients had rebleeding and 4 (22.22%) patients died before second look endoscopy because of associated comorbid and ischemic heart disease, 14 patients needed second look endoscopy for rebleeding and out of these 14 patients, four patients needed angiographic embolisation and 6 could be managed with endotherapy, four patients died because of cardiovascular events.

Table 3: Distribution of Sociodemographic and Clinical Parameters with Respect to Rebleeding and Death

Variables	Rebleeding (n=18) N (%)	Death (n=11) N (%)
Age > 65	14 (77.78%)	9 (81.82%)
Gender		
Male	14 (77.78%)	8 (72.73%)
Female	4 (22.22%)	3 (27.27%)
Ulcer Site	-	-
Duodenal	13 (72.22%)	9 (81.82%)
Gastric	3 (16.67%)	1 (9.09%)
Gastroduodenal	2 (11.11%)	1 (9.09%)
Forrest Class		
Ia	7 (38.89%)	5 (45.45%)
Ib	5 (27.78%)	3 (27.27%)
IIa	5 (27.78%)	3 (27.27%)
IIb	1 (5.56%)	0 (0.00%)
Drugs		
NSAIDs	5 (27.78%)	-
Dual Antiplatelets	5 (27.78%)	-
Oral Anticoagulants	3 (16.67%)	-
Comorbid Illness		
Cardiovascular Disease	4 (22.22%)	2 (18.18%)
Cerebrovascular Disease	1 (5.56%)	0 (0.00%)
Pulmonary Disease	1 (5.56%)	0 (0.00%)
Rheumatological Disease	2 (11.11%)	1 (9.09%)
Kidney Failure	4 (22.22%)	1 (9.09%)
Liver Failure	4 (22.22%)	2 (18.18%)
Cancer	4 (22.22%)	3 (27.27%)
Diabetes Mellitus	8 (44.44%)	3 (27.27%)
Smoking	5 (27.78%)	5 (45.45%)

DISCUSSION

This study showed that *H. Pylori* infection is the major cause of peptic ulcers in our population followed by NSAIDS use, especially in elderly population. These results are like other local and international studies [8, 9]. However, in many developed countries NSAIDs use is becoming a more common cause of bleeding ulcers due to increasing use and decrease in *H. Pylori* prevalence [8]. Low dose aspirin is another because that results in bleeding ulcers and its risk of bleeding increases if it's used in combination with NSAIDs. As the number of people who are using low dose aspirin for primary or secondary prevention of cardiovascular or cerebrovascular events, so does the risk of peptic ulcer bleeding. Most patients with bleeding ulcers had multiple risk factors like Dual antiplatelet therapy, smoking. The most common site for peptic ulcer is duodenal bulb. Adrenaline therapy alone is less effective than other monotherapy like thermal or mechanical therapies with hemostatic clips, also adding a second therapy after adrenaline is significantly more effective than either of the therapies alone [10, 11]. We used dual therapy in all our patients depending upon the ulcer characteristics and location. In most of the patients the initial hemostasis was successful. Rebleeding was seen in 18% of our patients. The rebleeding rates seen in different studies vary from 8-25% [10, 11]. Risk for rebleeding are multiple, including large sized ulcers (>2cm), depth, active bleeding during endoscopy, site of ulcer i.e. ulcer on posterior duodenal wall or gastric curve, severe coagulopathies, coexisting medical conditions, shock or hypotension during presentation [10, 12]. In our study the risk factors for rebleeding included patients with rebleeding had underlying diseases like rheumatologic

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diseases, renal or liver diseases or had multiorgan failures. The patients requiring surgery had high mortality in both patient groups, i.e. the ones with failed primary hemostasis and those whole failed therapies after rebleeding. Peptic ulcer bleeding is more common in elderly. 8% to 15% of patients did not receive effective endoscopic hemostasis [1]. A patient's ulcer's size, depth, location, and the point at which the bleeding began when they were an inpatient all affect how often they bleed again. According to reports, the majority of rebleeding events take place during the first seven days [10]. Angiographic embolization should be administered to patients who did not achieve hemostasis with endoscopic measures. Angiographic embolization has fewer problems than surgery, although the rate of rebleeding is greater. Wong *et al.,* enrolled a total of 101 patients who had bleeding peptic ulcers that could not be stopped using endoscopic hemostasis [13]. 50 patients underwent angiographic embolization, and the other 51 patients underwent surgery to remove the ulcer. According to the study, angiographic embolization had a better success rate (96% vs. 86%) for successfully controlling bleeding than surgery. The patients who underwent angiographic embolization also had a shorter hospital stay and a lower incidence of complications compared to those who underwent surgery [13]. The study suggests that angiographic embolization may be a more effective and less invasive treatment option for patients with bleeding peptic ulcers after failed endoscopic hemostasis compared to surgery. But it is imperative to acknowledge that the study was subject to certain limitations, including a small sample size and a lack of randomization, which could potentially impact the findings' generalizability [13]. Repeated endoscopic therapy is an effective way to treat bleeding that recurs after an initial endoscopic hemostasis procedure. Similar hemostasis is achieved with considerably fewer postoperative complications with repeated endoscopic therapy than with surgery [10]. In the past, surgery has been the first line of treatment when an endoscopy fails. Surgery for bleeding ulcers is still necessary in two main situations. Firstly, Persistent Bleeding refers to the continuation of bleeding despite attempts at endoscopic treatment. Secondly, recurrent bleeding entails the reappearance of bleeding even after an initially successful endoscopic treatment, possibly necessitating surgical intervention for effective management. Thus, surgery remains an option for bleeding ulcers when endoscopic methods don't work initially or when bleeding recurs after successful treatment. Essentially, because of an unsuccessful endoscopic procedure, 2.3% to 10% of patients need surgery [12]. A recent study found that factors such as patient age, concomitant diseases, hemodynamic instability upon admission, intra-hospital bleeding, recurrent bleeding, and surgical necessity all had an impact on mortality in patients following therapeutic endoscopy [5]. Rebleeding and mortality are two adverse PUB outcomes that have been discovered to have a strong correlation with age. The article by Chung *et al.,* provides an overview of the current understanding of Idiopathic Peptic Ulcers (IPUs) and suggests a systematic approach for their diagnosis and treatment [14]. The authors emphasize the importance of distinguishing IPUs from ulcers caused by other factors, as the management of IPUs may differ from that of other peptic ulcers. They suggest that a systematic approach should be taken to diagnose IPUs. This includes multiple diagnostic procedures such as upper endoscopy, biopsy, and serum gastrin levels in addition to a thorough history and physical examination [14]. Lau *et al.,* identified several risk factors associated with complicated PUD, including advanced age, male gender, use of non-steroidal anti-inflammatory drugs /NSAIDs, smoking, *H. Pylori* infection, and comorbidities such as liver disease, renal failure, and malignancy. Furthermore, mortality rates associated with complicated PUD were high, ranging from 5.5% to 14.5%. The authors noted that Patients with comorbidities had significantly higher rates of mortality and those who experienced perforation or bleeding [15]. The study by Toka *et al.,* aimed to compare the efficacy and safety of the treatment of bleeding peptic ulcers: monopolar hemostatic forceps with gentle coagulation is preferable over hemoclip [16]. The study found that the frequency of bleeding again in 30 days was significantly lower in the monopolar hemostatic forceps group compared to the hemoclip group (5.3% versus 19.6%, respectively). The monopolar hemostatic forceps group also had a significantly higher technical success rate (98.2% versus 85.7%), a shorter time to hemostasis (2.2 minutes versus 3.6 minutes), and a shorter length of hospital stay (4.4 days versus 5.3 days) compared to the hemoclip group. There were no discernible variations in the adverse outcomes between the two groups. Similar findings were revealed by other authors in literature [16-18]. Overall, the current study suggests that *H. Pylori* infection is the major cause of peptic ulcers in our population followed by NSAIDS use, especially in elderly population. These findings are compatible with the previous study [20]. The bleeding rate after surgery was 18%. Further research is required to corroborate these findings and determine the optimal treatment plan for this condition.

CONCLUSIONS

In summary, this study provides important understandings into the management of upper gastrointestinal bleeding in a cohort of 100 patients. The findings suggest that dual therapy, hemostatic clips, and electrocoagulation heat therapy are effective in achieving initial hemostasis in most

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cases. Though, insignificant proportion of patients experience heavy bleeding during endotherapy and require urgent laparotomy. Rebleeding remains a significant complication, and cardiovascular events can also contribute to mortality. Still more research is needed to recognize such strategies to reduce the likelihood of these adversative effects in patients experiencing upper gastrointestinal hemorrhage.

Authors Contribution

Conceptualization: FJ
Methodology: FJ, GUH, HURK
Formal Analysis: AD
Writing, review and editing: SR, AD, BN

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

An Evaluation of Platelet Indices in Newly Diagnosed Cases of Acute Myocardial Infarction

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ABSTRACT

Acute myocardial infarction (AMI) is characterized by prothrombotic phenotype associated with endothelial dysfunction, an increase in platelet activation and systemic inflammation. Platelet aggregation and activation are crucial in the formation of thrombi and acceleration of atherosclerosis, associated with unstable angina, sudden cardiac death is brought on by an acute myocardial infarction. **Objective:** To evaluate the platelet-indices in newly diagnosed cases of acute myocardial infarction. **Methods:** This cross-sectional study was conducted during November 2022 to December 2023 in Pathology Department of Sheikh Zayed Medical College/Hospital Rahim Yar Khan. Samples were collected from the patients of AMI admitted to Emergency Ward and from healthy controls as well. Complete Blood Count (CBC) with platelet indices, platelet count, Mean Platelet Volume (MPV), Platelet Crit (PCT) and Platelet Distribution Width (PDW) were investigated on five-part automated hematology analyzer BT-PRO 2300. Analysis of the data was done by using SPSS version 20.0. **Results:** Total 140 patients were divided into a healthy control group (70) and newly diagnosed cases of acute myocardial infarction (70). Among diagnosed cases of AMI 46 (65.7%) had ST-elevation myocardial infarction (STEMI) and 24 cases (34.2%) got non-ST-elevation myocardial infarction (NSTEMI). It was found that AMI patients had lower platelet counts and PCT with higher MPV and PDW. **Conclusions:** It was concluded that the platelet indices (PDW, and PCT, MPV) are significant predictors of myocardial infarction. They might be applied as an easy, reliable, and economical way to anticipate an impending acute coronary event.

INTRODUCTION

Acute Myocardial Infarction (AMI) is the major cause of deaths in developed and developing countries [1]. Myocardial infarctions occur when a thrombus abruptly blocks the coronary artery. The World Health Organization estimates that in developed nations, cardiovascular illnesses account for one in three deaths (31% of all deaths) [2]. AMI impairs coronary artery blood flow and partially or completely obstructs the coronary artery is a sign of coronary artery disease (CAD) in an emergency situation [3]. ST-elevation myocardial infarction (STEMI) and non-ST-elevation myocardial infarction (NSTEMI) refers to potentially fatal conditions that arise when the blood supply to the heart is compromised due to the destabilization of an atherosclerotic plaque. This change prevents the heart muscle from working properly and may possibly be fatal [4]. The signs of an acute myocardial infarction (AMI) include shortness of breath, tachycardia, vertigo, fainting and sudden development of mediastinal chest pain or pressure, which typically radiates to the left arm and neck, cardiac arrest or newly developed congestive heart failure [5]. Platelets play a vital role in atherothrombosis, the substantial cause of unstable coronary syndromes [6]. Platelets secrete and express large number of essential mediators of coagulation, thrombosis, inflammation and atherosclerosis [7]. Mean platelet volume (MPV) is a potential marker of platelet reactivity [8]. MPV estimation is routinely available in the inpatient and outpatient setting at a minimum cost. MPV

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elevation is associated with other markers of platelet's activity, together with increased platelet aggregation, increase in thromboxane synthesis, β-thromboglobulin release, and overexpression of adhesion molecules [9]. Risk of acute myocardial infarction (AMI) rises with age, irrespective of gender. According to the French ONACI registry, the prevalence of acute myocardial infarction is approximately 1% in the 45–65 age range and rises to approximately 4% in the 75–84 age group [10]. The ratio of men to women among people suffering in Pakistan is 1.02:1. In both the male and female population, the prevalence of coronary artery disease (CAD) is 1.3%. There is 1.2% prevalence in people under 50 years and a 2.03% prevalence in people over 60 years [11]. The main methods for evaluating the Acute Myocardial Infarction (AMI) include Electrocardiogram (ECG), Blood Tests, Chest x-ray (CXR), Echocardiography (ECHO), stress tests and cardiac catheterization. Atrial fibrillation, acute cardiac syndrome, congestive cardiac failure, cardiogenic shock, rupture of the ventricular free wall, pericardial effusion, aneurysm development and mural thrombi are the main consequences of coronary artery disease [12]. Platelet volume indices (MPV and PDW) are included in complete blood count (CBC). Elevated mean platelet volume (MPV) suggests thrombosis or hypercoagulability of the platelet. The active platelet release is reflected in platelet distribution width (PDW) as a variation in size of platelets [13].

Therefore, the current study was carried out to assess the platelet volume indices and platelet count in newly diagnosed patients of Acute Myocardial Infarction (AMI).

METHODS

This cross-sectional study was conducted at in pathology department of Sheikh Zayed Medical College/Hospital, Rahim Yar Khan, after getting approval from the Institutional Review Board (IRB) wide reference number 487/IRB/SZMC/SZH dated 10/08/2022. A sample size of 70 was calculated with expected difference of 8 between PDW of MI and control group and 99 % of confidence interval, 1 % of margin of error. This calculated sample size of 70 was doubled to 140 for better precision [14]. Convenient sampling technique was used. For patients' group subjects with Acute Myocardial Infarction (AMI) were included in the study while controls were normal population. Subjects with any other coronary illness was excluded from the study. Blood samples from newly diagnosed patients of Acute Myocardial Infarction (AMI) and the healthy individuals (control) were drawn and processed on fully automated 5-part hematology analyzer BT-Pro 2300. Platelet indices, (platelet count, PCT, PDW and MPV were measured. Data were analyzed using SPSS version 20.0 with by applying descriptive statistics. ANOVA test was applied to compare three groups. Mean and standard deviation was used to present quantitative data while qualitative data were presented percentages and frequencies.

RESULTS

Total 140 patients were selected and divided into (02) groups, 70 newly diagnosed cases of acute myocardial infarction of which 46 cases (65.7%) were having ST-elevation (MI) and 24 cases (34.2%) got non-ST-elevation (MI), the 70 healthy individuals were taken as the control group (table 1).

Table 1: Group Wise Distribution of the Study Subjects

Baseline Characteristics	Frequency (%)
Controls	70 (100 %)
NSTEMI	24 (34.2%)
STEMI	46 (65.7%)

Table 2 shows that the mean age along with SD of the patients amongst study subjects diagnosed as STEMI was (55.87 ± 12.6), NSTEMI (59.75 ± 8.6) and (52.61 ± 5.8) among controls (with p-value 0.003). MPV of STEMI patients was found to be (9.054 ± 0.6), NSTEMI (9.058 ± 0.6) and (7.941 ± 0.6) in control group (with P-value 0.000). PDW was found to be (16.8 ± 1.5), (16.6 ± 2.5) and (15.9 ± 1.4) amongst STEMI, NSTEMI and controls (with P-value 0.029). PCT value (0.174 ± 0.05), was observed (0.172 ± 0.06) and (0.207 ± 0.05) among STEMI, NSTEMI and control group (with P-value 0.002) and platelet count was (215.85 x109/L ± 73.5), (209.75 x109/L ± 62.0) and (259.50 x109/L ± 67.3) amongst STEMI, NSTEMI and controls with (0.001 P-value).

Table 2: Comparison of Age, MPV, PDW, PCT and Platelets in STEMI, NSTEMI and Healthy Control Group

Variables	STEMI	NSTEMI	CONTROLS	p-value
	Mean ± SD	Mean ± SD	Mean ± SD	
Age	55.87 ± 12.680	59.75 ± 8.614	52.61 ± 5.834	0.003
MPV	9.054 ± 0.632	9.058 ± 0.646	7.941 ± 0.692	0.000
PDW	16.817 ± 1.569	16.679 ± 2.521	15.989 ± 1.477	0.029
PCT	0.174 ± 0.055	0.173 ± 0.062	0.208 ± 0.0512	0.002
Platelet Count (x10^9 /L)	215.85 ± 73.506	209.75 ± 62.055	259.50 ± 67.37	0.001

Figure1 shows that there were 10 males and 14 females in NSTEMI, 33 males and 13 females in STEMI and 57 males and 13 females in control group.

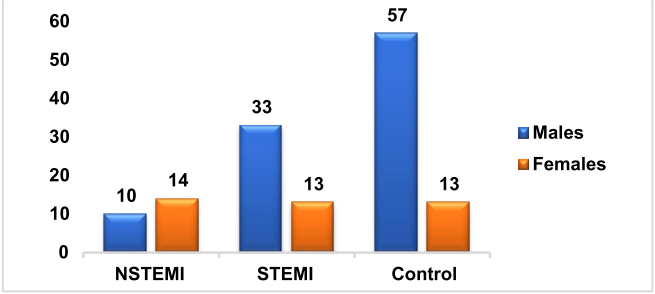

Figure 1: Gender Wise Distribution of the Study Subjects

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Mean age was found to be 54.91, mean value of MPV was 8.499, mean value of PDW was 16.379, mean value of PCT was 0.19071 and mean platelet count observed was 236.63 as shown in figure 2.

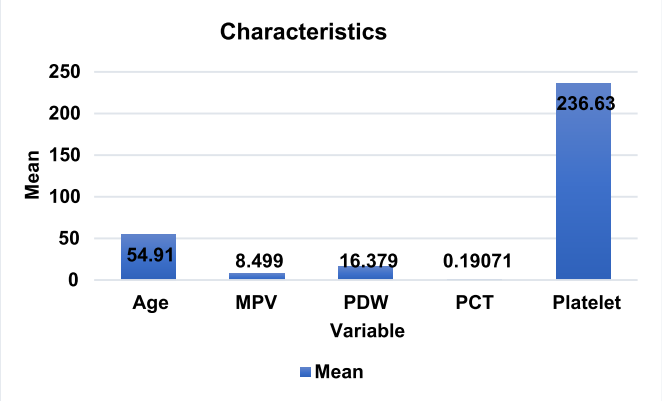

Figure 2: Overall Characteristics of Age, MPV, PDW, PCT and Platelets

DISCUSSION

Platelets have a critical role in formation of thrombus subsequent to the rupture of an atherosclerotic plaque, which results in myocardial infarction [15]. Following CBC, the platelet volume indices with mean platelet volume (MPV), platelet distribution width (PDW) and plateletcrit (PCT) can be used to quickly determine the size and reactivity of the platelets. In the present investigation, we identified the relationship between MPV, PDW and PCT with myocardial infarction (MI). In present study (140 cases) were studied comprising of STEMI (46 cases), NSTEMI (24 cases) and control group (70 cases). In this research, the mean age among STEMI patients was found (55.87 ± 12.6) years, NSTEMI (59.75 ± 8.6) years and (52.61 ± 5.8) years among healthy controls (p-value 0.003). A study conducted in Egypt by Hassan et al., reported the mean age of the diagnosed cases was (58.71 ± 13.42) years and that of control group was (57.41 ± 12.15) years [16]. In current study, patients with myocardial infarction (MI) had higher MPV (9.054 ± 0.6), (9.058 ± 0.6) in STEMI and NSTEMI counter to the control group (7.941 ± 0.6). PDW was also higher (16.8 ± 1.5), (16.6 ± 2.5) in STEMI and NSTEMI than control (15.9 ± 1.4). While patients with myocardial infarction had lower PCT (0.174 ± 0.05), (0.172 ± 0.06) in STEMI and NSTEMI than control (0.207 ± 0.05) and lower platelet count (215.85 x109/L ± 73.5), (209.75 x109/L ± 62.0) in STEMI and NSTEMI as compared to control (259.50 x109/L ± 67.3). A study conducted in Egypt selected 75 subjects including cases and controls groups, MPV (10.21 ± 1.15) and PDW (18.02 ± 1.49) were also higher in MI group than control group MPV(9.50 ± 1.33), PDW(10.14 ± 2.13) [17]. Another study from India including 65 cases with MI and control group reported that MPV (8.2 fL) and PDW (16.9%) were raised in MI group than control group with MPV (6.8 fl) and PDW (14.9 %) and platelet count was higher in control group (274×109 /L) than MI group (203×109/L) similar to our study [18]. A recent study in India was performed on 70 cases, and the results were compared to 70 controls. PDW was found to be (10 ± 0.7) in control group and was (13.2 ± 1.0), (12.6 ± 0.8) among STEMI and NSTEMI patients (with p value <0.001). MPV was observed to be (8.9 ± 0.9) in the controls and (12 ± 1.4), (11.5 ± 1.2) in the STEMI and NSTEMI patient groups (with p value <0.001). PCT was (0.19 ± 0.05) in control group and was (0.32 ± 0.05), (0.28 ± 0.06) in STEMI and NSTEMI patients respectively (with p value <0.001). This study revealed that MI patients had greater MPV and PDW levels than the control group similar to our study while contrary to our study PCT was higher in conrols than cases [19]. A study conducted in India on 60 cases of MI and 60 healthy controls reported that mean age of of the controls was (56.58 ± 9.608) years, while the cases were (56.53 ± 9.14) years. The mean platelet volume (MPV) of the cases was substantially higher (11.97 ± 1.458) than that of controls (10.7 ± 0.940). Additionally it was discovered that platelet distribution width was higher in cases (15.23 ± 3.503) than controls (13.25 ± 2.526). In comparison to controls plateletcrit (PCT) was lower in cases (0.266 ± .0641) than controls (0.320 ± .0133). Moreover, it was shown that the mean platelet count in patients (231.25 ± 67.27) was lower than in controls (276.38 ± 120.86). Similar to our study, it was demonstrated that showed that AMI group had higher MPV and PDW than the control group and that the AMI patients had had lower PCT and platelet counts [20].

CONCLUSIONS

Current study deduced that the patients with acute myocardial infarction (MI) have higher MPV and PDW in STEMI and NSTEMI patients and the patients diagnosed with myocardial infarction (MI) bears lower PCT and platelet count in STEMI and NSTEMI. Current study results reveal that increased platelet volume indices contribute to the pre-thrombotic state in acute myocardial infarction (AMI) and that larger platelets play a specific role in infarction and are hemostatically more active.

Authors Contribution

Conceptualization: MBG
Methodology: FY, SA, FH
Formal Analysis: MBG, FS, BB
Writing-review and editing: MBG, FS, BB, SA, ZH

All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Comparison of Oral Versus Intravenous Iron Therapy in Improving Hemoglobin Status in Patients of Chronic Kidney Disease

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ABSTRACT

Anemia (particularly iron deficiency) is an important concern in patients with chronic kidney disease (CKD) as it reflects the outcome of the disease. **Objective:** To compare the treatment efficacy of oral versus intravenous iron supplementation in improving the hemoglobin status of patients with chronic kidney disease not on hemodialysis or erythropoietin. **Methods:** Randomized controlled trial was carried out in Medicine Department of Pak Emirates Military Hospital, Rawalpindi from Jun 2023 to Dec 2023. Patients in Group I received intravenous iron sucrose 200 mg once a week diluted in 500 ml of 0.9% normal saline given over 60-90 minutes. Patients in Group O received oral iron supplementation in a dose of 325 mg (containing 65 mg of elemental iron) thrice a day taken one hour before taking their meals with a glass of water. The treatment was continued for 4 weeks. **Results:** Mean values of serum iron were 84.41±5.56 mcg/dl in Group I versus 84.67±5.43 mcg/dl in Group O before the start of therapy (p=0.726). Serum values for iron post-therapy were 143.40±6.01 mcg/dl in Group I versus 125.35±6.68 mcg/dl in Group O (p<0.001). Mean values for serum hemoglobin were 7.74±0.74 g/dl in Group I versus 7.61±0.82 g/dl in Group O before the start of therapy (p=0.256). Serum values of Hb post-therapy were 12.31±0.71 g/dl in Group I versus 9.91±0.82 g/dl in Group O (p<0.001). **Conclusions:** We conclude that Intravenous (IV) iron is superior to oral iron supplementation in improving iron stores and Hb levels in CKD patients not on dialysis and/or erythropoietin.

INTRODUCTION

The global prevalence of chronic kidney disease has been alarmingly high in the past two decades. The estimated prevalence of the general population suffering from chronic kidney disease has been >10% amounting to more than 850 million individuals suffering from the ailment worldwide in 2022 [1]. With such a high burden of disease, the number of cases is projected to increase by 2050, especially due to risk factors like malnutrition, hypertension, and diabetes mellitus on the rise as well [2]. In Pakistan, the prevalence among all age groups was 21.2% according to a recent study [3]. Anemia associated with iron deficiency is one of the hallmark features of the disease. The pathogenesis proposed is multifactorial and is attributed to deficiency in erythropoietin production, blood loss during hemodialysis, chronic inflammation, decreased absorption of iron and mechanism leading to relative and absolute deficiency of iron in the body [4]. Patients on hemodialysis are more prone to blood loss and iron deficiency and are advised intravenous iron supplemental as a mandatory treatment regime [5]. The

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successful treatment of CKD anemia is accomplished with recombinant human erythropoietin. Several studies have shown that in almost all erythropoietin-treated patients, iron supplementation is needed because iron deficiency may contribute to erythropoietin hypo-responsiveness [6, 7]. Various studies advocate IV therapy in a large number of chronic kidney disease patients not on dialysis or on erythropoietin also present with iron deficiency anemia. Intravenous iron supplemental is not warranted in all patients with mild to moderate disease and the allergic tendency of IV iron restricts its broad use in resource constrained setups requiring monitoring and admission for administration. The use of oral supplemental in these patients have been a matter of debate and whether it is more effective or on par in improving the hemoglobin status in patients with mild to moderate disease who are not on hemodialysis or erythropoietin. We aim to study this cheaper, cost-effective, and safe alternative and compare it to the intravenous formulations to see the increase and improvement in hemoglobin status post-therapy.

The study was conducted to compare the treatment efficacy of oral versus intravenous iron supplementation in improving the serum iron and hemoglobin status of patients with chronic kidney disease not on hemodialysis or erythropoietin.

METHODS

This randomized controlled trial was carried out at the Department of Medicine, Pak Emirates Military Hospital, Rawalpindi from Jun 2023 to Dec 2023. Trail ID 73381, IRCT Id, IRCT20310030596O5N1 registered at https://irct.behdasht.gov.ir/trial/73381. Sample size was calculated keeping the confidence interval at 95%, power of test at 80% with mean difference observed for increase in serum iron being 41.88±5.69 mcg/dl in the IV iron supplementation group and 39.68±2.23 mcg/dl in the oral iron supplementation group after therapy [8]. Minimum sample size came out to be 89 for the IV group and 101 for the oral group keeping the population variance at 10,000. We initially included 250 patients for the RCT with 210 patients in the final study design after meeting inclusion criteria divided into two groups of IV versus oral iron supplemental group with 105 participants in each. Method of sampling was non-probability consecutive by lottery method. Ethical review board's permission was taken on 25 May 2023, IRB no A/28/ER/554/23. Inclusion criteria included that all male and female patients over the age of 18 years not on hemodialysis or erythropoietin diagnosed as anemia with a baseline Hb of less than 13 g/dl in males and less than 12 g/dl in females with established chronic kidney disease with a GFR (glomerular filtration rate) of less than 60ml/min for more than 90 days assessed using the CKD-EPI equation and/or hyper albuminuria with urine albumin ≥ 30 mg in 24 hours or urine albumin to creatinine ratio (ACR) ≥ 30 mg/g. Exclusion criteria included that patients on dialysis, erythropoietin or use of erythropoietin stimulating agents (ESAs) in the last 3 months, patients with advanced liver, cardiac or ESKD (end-stage kidney disease), drug allergies to iron and its supplemental form during therapy or previous known history or unwilling to be included in the study. The RCT included all the assessed participants for eligibility and meeting the inclusion criteria divided into the intravenous iron supplementation group (Group I) (n=105) and the oral iron supplementation group (Group O) (n=105) (Figure 1). Patients in Group I received intravenous iron sucrose 200 mg once a week diluted in 500 ml of 0.9% normal saline given over 60-90 minutes under observation in the medical ward. Allergy if any assessed by the doctor on duty was treated with prompt cessation of therapy and administration of IV hydrocortisone 200 mg stat and IV promethazine 25 mg stat and observed for 3 hours or till signs and symptoms settled. Patients in Group O received oral iron supplementation in a dose of 325 mg (containing 65 mg of elemental iron) thrice a day taken one hour before taking their meals with a glass of water. The treatment regime was started using the standard KDIGO (kidney disease: improving global outcomes) guidelines. Intolerable side effects including allergy and severe gastric upset were indications for cessation of therapy and exclusion from the trial group. The therapy was carried out for 4 weeks and patients were advised weekly follow-up for assessment. Samples taken at the end of the trial period were done with patients with 10 hours fast and 7 days after the completion of therapy. Primary variables observed were changes in the serum iron, Hb, transferrin and TIBC, that were measured through blood sample collected and analyzed through standard ROCHE analyzer for the samples taken. Secondary variables observed were the adverse effect profile seen with both treatment regimes. Demographic data were statistically described in terms of mean, standard deviations, frequencies, and percentages when appropriate. Independent sample t-test was used to study mean values between both groups. A p value of ≤ 0.05 was considered statistically significant. All statistical calculations were performed using Statistical Package for Social Sciences 26.0.

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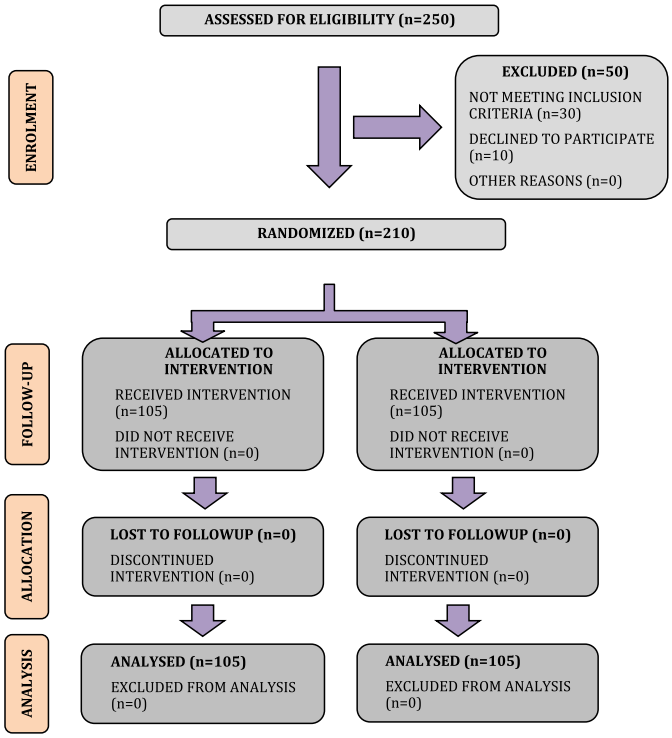

Figure 1: Phases of Randomized Controlled Trial

RESULTS

A total of 210 patients were analyzed in the study protocol divided into the IV iron group (Group I) (n=105) and the oral iron group (Group O)(n=105). Mean age of patients in Group I was 41.75±5.85 years versus 42.07±6.11 years in Group O (p=0.695). Mean weight was 63.70±4.04 kg in Group I versus 63.88±4.00 kg in Group O (p=0.745). Gender distribution revealed 86 (81.9%) males and 19 (18.1%) females in Group I versus 86 (81.9%) males and 19 (18.1%) females in Group O (table 1).

Table 1: Demographic Characteristics of Both Groups (n=210)

Variable	Group I (n=105)	Group O (n=105)
Age (Years)		
Mean±SD	41.75±5.85	42.07±6.11
Weight (Kg)		
Mean±SD	63.70±4.04	63.88±4.00
Gender		
Male	86 (81.9%)	86 (81.9%)
Female	19 (18.1%)	19 (18.1%)

Mean values of serum iron were 84.41±5.56 mcg/dl in Group I versus 84.67±5.43 mcg/dl in Group O before the start of therapy (p=0.726). Serum values for iron post-therapy were 143.40±6.01 mcg/dl in Group I versus 125.35±6.68 mcg/dl in Group O (p<0.001). Mean values for serum hemoglobin were 7.74±0.74 g/dl in Group I versus 7.61±0.82 g/dl in Group O before the start of therapy (p=0.256). Serum values of Hb post-therapy were 12.31±0.71 g/dl in Group I versus 9.91±0.82 g/dl in Group O (p<0.001). Mean serum ferritin levels before the start of therapy were 102.20±5.03 ng/ml in Group I versus 102.27±4.90 ng/ml in Group O (p=0.912). Same values measured post-therapy were 130.83±3.41 ng/ml in Group I versus 120.85±10.83 ng/ml in Group O (p<0.001). Mean serum transferrin levels measured were 232.61±12.92 mg/dl in Group I versus 231.98±12.50 mg/dl in Group O before the start of therapy (p=0.721). Post-therapy levels were 302.51±9.52 mg/dl in Group I versus 285.18±3.70 mg/dl in Group O (p<0.001). Mean TIBC values pre-therapy were 383.78±9.41 mcg/dl in Group I versus 383.86±9.52 in Group O (p=0.948). Values observed post-therapy were 349.93±9.84 in Group I versus 363.28±5.00 in Group O (p<0.001)(table 2).

Table 2: Comparison of Primary Variables between Both Groups (n=210)

Variable	Group I (n=105)	Group O (n=105)	p-Value
Mean Serum Iron (Mcg/Dl)			
Before Therapy	84.41±5.56	84.67±5.43	0.726
After Therapy	143.40±6.01	125.35±6.68	<0.001
Mean Hemoglobin (G/Dl)			
Before Therapy	7.74±0.74	7.61±0.82	0.256
After Therapy	12.31±0.71	9.91±0.82	<0.001
Mean Serum Ferritin (Ng/Ml)			
Before Therapy	102.20±5.03	102.27±4.90	0.912
After Therapy	130.83±3.41	120.85±10.83	<0.001
Mean Serum Transferrin (mg/dl)			
Before Therapy	232.61±12.92	231.98±12.50	0.721
After Therapy	302.51±9.52	285.18±3.70	<0.001
Mean Total Iron Binding Capacity (mcg/dl)			
Before Therapy	383.78±9.41	383.86±9.52	0.948
After Therapy	349.93±9.84	363.28±5.00	<0.001

Comparison of adverse effects profile showed that constipation was reported by 15 (14.3%) patients in Group I versus 40 (38.1%) patients in Group O. Diarrhea was reported by 06 (5.7%) patients in Group I versus 11 (10.5%) patients in Group O. Allergy to iron formulations was seen in 12 (11.4%) patients in Group I versus 05 (4.8%) patients in Group O. The frequency of nausea was equal in both groups with 03 (2.9%) patients reporting the complaint. Headache was not reported by any in Group I versus 05 (4.8%) patients in Group O. Hypotension was seen in 16 (15.2%) patients in Group I versus 00 (0%) patients in Group O (table 3).

Table 3: Comparison of Adverse Effect Profile between Both Groups (n=210)

Variable	Group I (n=105)	Group O (n=105)
Constipation	15 (14.3%)	40 (38.1%)
Diarrhea	06 (5.7%)	11 (10.5%)
Allergy	12 (11.4%)	05 (4.8%)
Nausea	03 (2.9%)	03 (2.9%)
Headache	00 (0%)	05 (4.8%)
Hypotension	16 (15.2%)	00 (0%)

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DISCUSSION

The study was carried out at our demographic setup to assess the efficacy of intravenous versus oral iron supplements to improve the iron levels and hemoglobin status in patients with chronic kidney disease. The prevalence of chronic kidney disease in Pakistan is increasing at an astonishing rate and the need for prolonged therapy for the primary disease as well as optimization required for the added complications is a major resource burden on our crippled health care system [9]. Anemia is one of the major complications associated with the disease and a landmark study by Obrador *et al.*, concluded that more than 68% patients with chronic kidney disease develop anemia during the disease process [10]. Even though aggressive strategies are required for correction of anemia in advanced cases and specially with patients on dialysis, those with mild to moderate disease can be treated effectively for anemia with oral or intravenous supplements. Whether one form proffers any advantage over the other was the aim since oral formulations if proven to be effective than IV form do not require detention and monitoring for their administration decreasing the hospital burden and resources. Not only correcting the anemia improve the physical status of the patients, but it also results in better cardiovascular stability and decreasing the complications associated with low Hb and cardiovascular compromise [11, 12]. Our study concluded that iron levels were improved in both the oral and the iron supplementation groups but there was a statistically significant improvement in the intravenous versus the oral form when the endpoint of the study was reached. The IV therapy group showed marked clinical improvement in the four weeks of therapy. The same was concluded by Gutierrez *et al* [13]. who observed marked improvement with the IV iron formulation in patients with chronic end stage kidney disease. Bazeley *et al.*, concluded that IV iron should be the preferred route in patients unless the therapy needs to be stopped due to allergic reaction or adverse effects not tolerable to the patient [14]. They also concluded that oral iron therapy should be the second line alternative in all cases unless indicated. Similar results were given by study done by Das *et al* [15]. When comparing the improvement in the hemoglobin status of the participants in both groups, a similar trend was seen where a statistically significant improvement was seen in the intravenous iron group as compared to the oral group. Our study included patients with mild and moderate amnesia and the mean rise was significantly high in the intravenous iron group at the end of four weeks of therapy. These findings were consistent with results of studies carried out by Riccio *et al.*, [16] and Lopes *et al* [17]. Another study by Ganz *et al.*, proposed that even with the added risk of infection with the IV route especially in severely debilitated patients, if used judiciously, the intravenous route should be the preferred method as the chances of infection are minimal [18]. When comparing the adverse effect profile, it is where the intravenous route offers a good advantage to patients than those on oral therapy. Gastrointestinal side effects associated with therapy were seen in around half of patients in the oral group in our study. Constipation remained the chief complaint followed by diarrhea, but none were severe enough to warrant discontinuation of therapy in our patients, but studies have concluded that patients become non-compliant to therapy following gastric side effects and they need to be monitored for effective results. These findings were consistent with those done by Emma *et al.*, [19] and Elstrott *et al* [20].

CONCLUSIONS

Our findings concluded that IV iron therapy was superior to oral iron supplementation in improving iron stores and Hb levels in CKD patients not on dialysis and/or erythropoietin.

Authors Contribution

Conceptualization: HN
Methodology: FR, UT, MFH, ZA
Formal analysis: HN, ZA
Writing-review and editing: ANC

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Evaluating the Impact of Smoking and Hyperlipidemia in Patients with Atherosclerotic Cardiovascular Disease

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ABSTRACT

Hyperlipidemia and Smoking are risk factors of atherosclerotic cardiovascular disease in Pakistani community. **Objectives:** To determine whether smoking and hyperlipidemia were associated with atherosclerotic cardiovascular disease. **Methods:** A comparative, cross-sectional study was conducted upon a sample of 200 male and female participants with different cardiac complications were selected and divided them into different groups like Group A and Group B. The individuals with medical complications such as severe chest pain, unexpected numbness or weakness in arms or legs and loss of vision were placed in Group A. While in Group-B 70 male and 30 female individuals with mild chest pain were include. BMI, Cholesterol, Triglyceride, LDL and HDL levels and other demographics such as age, smoking habits were measured respectively. **Results:** In Group A (severe disease group) there were 75 males and 25 females while in Group B (mild disease group) 70 male and 30 female individuals were listed. The mean age in Group A (59.09 ± 0.01) and Group B (59.09 ± 0.01). The results showed significant difference in Group A and B mean cholesterol (279.9 ± 0.04 vs. 239.09 ± 0.04), Triglycerides (187.02 ± 0.01 vs. 127.02 ± 0.01), LDL (153.01 ± 0.02 vs. 123.01 ± 0.02), HDL (49.04 ± 0.01 vs. 40.01 ± 0.01) and (p value<0.05). **Conclusions:** It was concluded that hyperlipidemia and smoking were significant (p≤0.05) risk factors for atherosclerotic cardiovascular disease, as seen by increasing levels of cholesterol, Triglycerides and LDL in cardiovascular patients.

INTRODUCTION

The buildup of lipids, cholesterol, and other materials in and on the arterial walls is known as atherosclerosis [1]. Arteries may constrict and get blocked by plaque. Additionally, a blood clot may form if the plaque bursts. It may damage arteries anywhere in the body, atherosclerosis is most frequently linked to the heart [2]. It is possible to cure atherosclerosis. An atherosclerosis prevention diet and lifestyle can assist. Once an artery has constricted or blocked to the point that it is unable to adequately provide blood to organs or tissues, atherosclerotic symptoms usually manifest. One can totally stop blood flow due to a blood clot. Angina or a stroke might result from the clot breaking apart [3]. The primary cause of cardiovascular illness is atherosclerosis, an inflammatory arterial disease linked to cholesterol and other metabolic alterations [4]. Cerebrovascular disease and ischemic heart disease (IHD) are the two main indicators of atherosclerotic cardiovascular disease (ACD). In Asia, ischemic heart disease and stroke rank as the third most prevalent causes of mortality [5]. As per many study articles and current world health organization (WHO) atherosclerotic cardiovascular disease is one of the major causes of mortality worldwide for both men and women. With 3.2 percent yearly increase, the prevalence of this disease is steadily rising in smokers and obese individuals [6]. Atherosclerosis is the result of a complex pathologic process. It is often linked to increased levels of LDL-C, a type of lipoprotein cholesterol that modifies cellular

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permeability and progressively damages artery walls [6, 7]. By encouraging circulating monocytes to attach to endothelial cells which subsequently produce adhesion molecules and selectin. This substrate triggers an inflammatory response by driving monocyte migration to the sub-endothelial region [8]. After that, monocytes change into foamy macrophages that are high in free fatty acids and cholesterol esters. These macrophages penetrate the artery walls, create a pathological lesion known as intimal thickening, and eventually cause the lipid pool to become necrotic. Atherosclerotic plaque's foamy macrophages are vulnerable to plaque fracture or rupture, which can result in life-threatening thrombosis [9, 10]. The phrase atherosclerotic cardiovascular disease (CVD) refers to a collection of heart and blood vessel conditions [11]. Worldwide, these illnesses are the main contributors to morbidity and early mortality. Coronary heart disease and cerebrovascular disease (stroke) are the most prevalent illnesses [12, 13]]. The second cause of CVD is the oxidation of LDL. Foam cells arise when the oxidation of LDL in the artery wall sets off an inflammatory cascade that initiates the atherogenic pathway. The first discernible atherosclerotic lesion is formed by fatty streaks, which are caused by the buildup of foam cells [14, 15]. The results of several investigations have led to the conclusion that smoking cigarettes is a significant risk factor for the emergence of clinical cardiovascular disease. To investigate the precise functions and interactions between smoking and hyperlipidemia in the development of atherosclerotic cardiovascular disease in people who have been diagnosed [16].

This study was conducted to create more effective preventive and management methods for atherosclerotic cardiovascular disease by providing deeper insights into the roles played by these risk factors in the illness by studying them in a clinical environment.

METHODS

A cross-sectional study was conducted in which blood samples were collected from diagnosed cardiac male and female patients. The aims and objectives of this study were to uncover the relationship between hyperlipidemia and smoking with atherosclerotic cardiovascular disease in both male and female genders. Current study was conducted in Medical and Cardiology Departments of Gorki Hospital Lahore, Jinnah Hospital Lahore, and Services Hospital Lahore from June 2023 to February 2024.The ethical approval clearance certificate Ref no.2023/3A was granted by ethical review committee, Faculty of Biological Sciences, Lahore University of Biological and Applied Sciences (UBAS). The age of all participants was in between 35 to 60 years. Body mass index, Smoking habits, Cholesterol, Triglycerides, and LDL and HDL were considered as inclusive biomarkers criteria. Individuals with renal diseases, pregnant women and diabetic patients were exclusive for current study. Total 200 male and female participants with different cardiac complications were selected and divided them into different groups such as Group A and Group B. In Group A 75 males and 25 females with severe chest pain, unexpected numbness or weakness in arms or legs and loss of vision were included while in Group B, 70 male and 30 female individuals with mild chest pain were listed. BMI, Cholesterol, Triglyceride, LDL and HDL levels and other demographics such as age, smoking habits and socioeconomic conditions were measured respectively. The sample size was calculated using a power analysis to assure 90% power to detect a significant difference in cardiovascular risk between smokers and non-smokers at an alpha level of 0.05, resulting in a sample size of 200 individuals. The Participants were chosen by stratified random sampling to reflect various age groups and genders in the community. For lipid profile tests about 5ml blood sample is taken with a needle inserted into a vein in the arm and stored in blood glass container after centrifugation. BMI values were determined using a well-defined questionnaire, along with other demographic variables including gender, age, smoking, drinking alcohol, and physical activity. Using SPSS version 22.0, bio-statistical processing were applied to the raw data. The correlations between smoking and lipid profile and atherosclerotic cardiovascular disease were investigated using a t-test and the derived means, standard deviations, frequencies, and percentages of participant characteristics. Means and standard deviations (Mean ± SD) were taken into consideration at significant levels ($p \leq 0.05$). To determine the significance of differences in biomarkers and smoking behaviors, the groups were compared using chi-square tests for categorical variables and t-tests for continuous variables.

RESULTS

In Group A (severe disease group) there were 75 males and 25 females with severe chest pain, unexpected numbness or weakness in arms or legs and loss of vision while in Group B (mild disease group) 70 male and 30 female individuals with mild chest pain were listed. The mean age in Group A was (59.09 ± 0.01) and Group B was (59.09 ± 0.01). Whereas the biomarkers such as gender, age, smoking habits, BMI, Cholesterol, Triglyceride, LDL and HDL were compared. The results showed significant difference in Group A and B Cholesterol (279.9 ± 0.04 vs. 239.09 ± 0.04), Triglycerides (187.02 ± 0.01 vs. 127.02 ± 0.01), LDL (153.01 ± 0.02 vs. 123.01 ± 0.02), HDL (49.04 ± 0.01 Vs. 40.01 ± 0.01) and (p-value<0.05) (Table 1).

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Table 1: Comparative Analysis of Biomarkers in Severe and Mild Disease

Parameter	Category	Group A (Severe) Mean ± SD	Group B (Mild) Mean ± SD	p-value
Gender	Male (%)	75 (75%)	70 (70%)	0.45*
	Female (%)	25 (25%)	30 (30%)	-
Age	Years	59.09 ± 0.01	59.09 ± 0.01	0.99
Smoking	Yes (%)	89 (89%)	45 (45%)	<0.01*
BMI	Kg/m^2	34.03 ± 0.01	25.01 ± 0.01	<0.05
Cholesterol	mg/dl	279.9 ± 0.04	239.09 ± 0.04	<0.05
Triglycerides	mg/dl	187.02 ± 0.01	127.02 ± 0.01	<0.05
LDL	mg/dl	153.01 ± 0.02	123.01 ± 0.02	<0.05
HDL	mg/dl	49.04 ± 0.01	40.01 ± 0.01	<0.05

(t-test for continuous variables, chi-square for categorical*)

DISCUSSION

Guddeti *et al.*, concluded that even before atherosclerosis develops, the complicated disorder known as hyperlipidemia affects the anatomy and function of the heart. It has long been recognized that serum lipids directly affect heart function in ways unrelated to atherosclerosis [1, 8, 17]. Nevertheless, recent studies by a number of experts have found that serum lipids may build up in the heart, cause oxidative stress and inflammatory cardiac fibrosis, reduce autophagy and microvascular density, and alter the way that cardiomyocytes mitochondria operate. Heart failure, myocardial injury, and electrophysiological abnormalities are more likely as a result of these impacts [10, 18]. The findings of Hitl *et al.*, were described that hypercholesterolemia promotes atherosclerosis and raises the risk of peripheral vascular disease, coronary artery disease, and stroke which has close similarities with the findings of present study [19]. This study has implications for the development of hypercholesterolemia. Raising cholesterol levels causes an increase in the formation of many atherogenic biomolecules, including proinflammatory cytokines interleukin IL-1, IL-2, IL-6, IL-8, and tumor necrosis factor-alpha (TNF-α) [20, 21]. According to the LDL receptor theory, atherosclerosis is caused by high blood levels of LDL, cholesterol, and cardiovascular disease can be avoided by reversing or at least delaying atherosclerosis [22]. Heart failure risk has been linked to high non-fasting triglyceride levels and cholesterol. Nonetheless, a low level of serum triglycerides raised the mortality rate of both ischemic and non-ischemic heart failure and was independently linked to a poor prognosis in patients with end-stage heart failure [23, 24]. Present study described that individuals with smoking habits showed high risk of cardiovascular medical complications and similar results were concluded by different studies. Almost every organ in the body is harmed by smoking, including the blood vessels, teeth, mouth, eyes, heart, reproductive organs, bones, bladder, and digestive organs [25]. The inhaled chemicals from smoking damage your heart and blood vessels, raising your risk of atherosclerosis, or the buildup of plaque in the arteries [26]. In this approach, smoking can damage the heart and blood vessels in any amount, even occasionally. Some people are considerably more at risk from smoking, especially those who have diabetes and those who take birth control pills [27]. Current study has significant ($p \leq 0.05$) correlation with the previous studies and showed similarities with the secondary data of different studies. The levels of Lipoproteins, Cholesterol and Triglycerides in both male and female participants in Group A vary significantly ($p \leq 0.05$) from those in Group B. The individuals how were come in tertiary care units with severe chest pain, unexpected numbness or weakness in arms, legs and loss of vision have a remarkable difference in different lipid profile biomarkers as compared with the individuals how has mild chest pain respectively [28].

CONCLUSIONS

Hyperlipidemia and smoking were significant ($p \leq 0.05$) risk factors for atherosclerotic cardiovascular disease, as seen by increasing levels of cholesterol, triglycerides and LDL in cardiovascular patients.

Authors Contribution

Conceptualization: HUK, HR, KB
Methodology: HR, BI
Formal analysis: HR
Writing-review and editing: BI, HUK, KB, A, SA, AS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Correlation of Demographic Characteristics to Bone Calcium and Vitamin D in Patient taking Proton Pump Inhibitor (PPI)

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ABSTRACT

Proton pump inhibitor (PPI) works by blocking the hydrogen-potassium ATPase inhibitor H/K ATPase inhibitor located on gastric parietal cells. It blocks the last step of acid production that is why it is more potent and effective than other acid suppressants like H2 blockers, 99% of gastric acid secretion is reduced by using it. **Objective:** To evaluate Demographic characteristics of individuals using proton pump inhibitor (PPI) all over Sindh. **Methods:** The Quasi experimental study contained 227 young individuals of age 20-45years having acid peptic disease, dyspepsia. Study was taken place in Medicine OPDs of Jamshoro and Hyderabad at Civil Hospital and duration of study was from 15th March 2020 to 15th September 2020. All individuals taking proton pump inhibitor were excluded from study. Sampling technique was non-probability convenient sampling. SPSS version 21.0 software was used to analyze the data. The student paired t test was used at the confidence interval of 95%, apart from it the P-value is observed ≤ 0.05. **Results:** There was no effect on demographic characteristics of individuals using proton pump inhibitor (PPI) all over Sindh on serum calcium and vitamin D levels. Therefore, p-value was seen 0.7 for the serum calcium and 0.1 for Serum Vitamin D. **Conclusions:** In any group of age, gender, residential status there is no effect on serum calcium and vitamin D with use of proton pump inhibitor (PPI) for less than 6 months.

INTRODUCTION

The first drug amongst Proton pump inhibitor (PPI) which came in market was Omeprazole in 1988, which is the most effective, safest drug used and is in list of World Health Organization (WHO) for essential medicine [1]. PPIs became one of the most important acid blocking agents used. The second drug used amongst PPIs was Lansoprazole, which came in market for first time in 1991 [2]. With time, other drugs came in market like Pantoprazole, Rabeprazole, Esomeprazole and Dex lansoprazole. They are amongst the most sold and used agents. PPI is the only acid blocking agent used for treating the disease known as gastroesophageal reflux (non-erosive), erosive esophagitis disease, dyspepsia disease and the peptic ulcer disease because of its efficacy and potency. However, overuse of it is examined as an immediate result of absence of determination of need for steady treatment in many outdoor subjects. Prolonged usage expands the rate of financial overburden and multiple minerals and deficiencies of vitamin [3]. The action procedure of proton pump inhibitor is to block hydrogen potassium ATPase enzyme that is present in parietal cells of mucosa in stomach, which behaves superintend for secretion of hydrogen ion in interchange of potassium ions in of stomach [4]. Proton pump inhibitor PPI, rational and irrational uses are yet increasing. Proton pump inhibitor PPI therapy was received by 8% of patients admitted in London hospital, while in Vliet *et al.*, about 43% of the admitted patients were having it throughout the period hospitalization in 2008 [5, 6]. In 2011, Sadaf *et al.*, 51 % of patients were taking proton pump inhibitor PPI without any

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specific symptom [7]. One study at Karachi hospital showed 47.2% of the patients were prescribed this drug on their discharge card. In 2013, Haroon *et al.*, 79% of the patients were prescribed proton pump inhibitor PPI that shows climbing utilization of proton pump inhibitor PPI [8, 9]. Most of studies, had crucial limitations, that includes the retrospective plan, the inability to complete control the prime potential confounder, the small number of the sample size, independent groups at the risk (age older than eighteen years/the post-menopausal in females and males individuals), retrospective consequence (fracture) ascertainment and less description on proton pump inhibitor PPI exhibition [10-12]. The main objective of the study is to estimate different demographics characteristics in those discrete who are using proton-pump inhibitor.

METHODS

The study was conducted in out-patient departments (OPDs) of Jamshoro and Hyderabad, Liaquat University Hospital, Medicine department. Study design used was quasi-experimental study. The study had a total of 227 young individuals which was calculated by using Cochran's formula as represented in Equation 1, having ages of 20-45 years. The inclusion criteria were those having age 20-45 years, those who are not on PPI, and those having acid-peptic disease and dyspepsia. The exclusion criteria were those previously taking PPI. Non-probability convenience sampling technique was used. The Statistical Package of Social Sciences (SPPS) version 21.0 was used to analyze the data.

$$\text{Cochran's formula } [n_o = \frac{z^2\, p\, q}{e^2}]$$

RESULTS

During six months duration of study, a total of 227 individuals were studied for their consequences of Proton Pump Inhibitor (PPI). Age distribution of patients done, it showed that 17.6 % (n=40) were between 20-29 years, while 35.7% (n=81) were between 30-39 years, 46.7 % (n=106) were between 40-45 years. Gender distribution showed that 31.7 % (n=72) were males and 68.3 % (n=155) were females. Residential status of patients was recorded which shows that 47.1 % (n=107) were urban and 52.8 % (n=120) belongs to rural area. Mean BMI was 21.6 ± 0.38 as shown in table 1.

Table 1: Demographic Characteristics before of PPI

Variables		Percentage
Age of Individuals in Study	20 – 29 years	17.6 %
	30 – 39 years	35.7 %
	40 – 45 years	46.7 %
Gender of Individuals in Study	Male	31.7 %
	Female	68.5 %
Residential Status of Individuals	Urban	47.1 %
	Rural	52.8 %
BMI		21.6 + 0.38
Duration of PP		5.5 Months
Serum Calcium		9.0 ± 0.25
Serum Vitamin D		50 ± 3.15

The mean + SD of serum calcium after use of Proton Pump Inhibitor (PPI) is 8.9 + 0.26 and 48.2 + 4.16 was for serum vitamin D as shown in table 2.

Table 2: Demographic Characteristics after Use of PPI

Variables		Percentage
Age of Individuals in Study	20 – 29 years	17.6 %
	30 – 39 years	35.7 %
	40 – 45 years	46.7 %
Gender of Individuals in Study	Male	31.7 %
	Female	68.5 %
Residential Status of Individuals	Urban	47.1 %
	Rural	52.8 %
BMI		21.6 + 0.38
Duration of PP		5.5 Months
Serum Calcium		8.9 ± 0.26
Serum Vitamin D		48.2 ± 4.16

The p-value of the chi square test is 0.7 for serum calcium and 0.1 for serum vitamin D. Therefore, study showed no effect on demographic characteristics having PPI as shown in table 3.

Table 3: P-value Before and After Use of PPI

Variables	p-value
Serum Calcium	0.7
Serum Vitamin D	0.1

DISCUSSION

Proton pump inhibitor PPI is the only acid blocking agent used for treatment of gastroesophageal reflux disease (non-erosive), erosive esophagitis, dyspepsia and the peptic ulcer disease because of its efficacy and potency [13]. In a survey, frequent use of proton pump inhibitor leads to failure of proper use of it in numerous outdoor patients. Prolonging the usage of it raises the rate of burden in terms of finance and multiple minerals and the deficiencies of vitamin [14, 15]. Our s6tudy focused on evaluate Demographic characteristics of individuals using proton pump inhibitor (PPI) all over Sindh. And find the association of these characteristics with the use of Proton Pump Inhibitor (PPI). We found the level of serum Calcium and Serum Vitamin D levels and compared the results before and after the use of PPI. All subjects selected in our study in age were young so, there was no significant possibility of fractures by diminishing levels of serum calcium and serum vitamin D levels following use of Proton Pump Inhibitor (PPI), although the risk rises in elder individuals as seen in study of Elaine *et al.*, which showed

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that Proton pump inhibitor PPI use in elderly individuals for longer duration and reduce intake of calcium, causes significant fractures other than spine [16, 17]. In our study, Proton Pump Inhibitor (PPI) did not have influence on serum calcium and serum vitamin D levels where, p-value was calculated 0.7 for calcium before and after use of Proton Pump Inhibitor (PPI) while, the p-value 0.1 that is calculated for serum vitamin D. Wright *et al.*, exhibit that there is no crucial variation in absorption and excretion of calcium regardless of utilization of Proton Pump Inhibitor (PPI) or not, a study conducted over serum calcium and urinary calcium excretion [18]. In our study, the results are aided by a study that manifests hypochlorhydria leads to Proton pump inhibitor PPI decline calcium absorption [19, 20].

CONCLUSIONS

In any group of age, gender, residential status there is no effect on serum calcium and vitamin D with use of Proton Pump Inhibitor (PPI) for less than 6 months.

Authors Contribution

Conceptualization: YM
Methodology: TZS
Formal analysis: IK
Writing, review and editing: IAS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Exploring Association of Level of Empathy with Demographic Factors among Medical and Dental Students, A Comparative Cross-Sectional Study

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ABSTRACT

Being an effective physician, one must possess both clinical expertise and a specific range of emotional competencies, including empathy. **Objective:** To determine the empathy scores among medical and dental students and to correlate them with demographic factors like age, gender and academic year. **Methods:** A cross-sectional survey was conducted involving 324 students from medical and dental programs at a private medical and dental college in Lahore. Empathy levels were measured using Jefferson Scale of Physician Empathy- student version (JSPE-S). Data analysis was done using SPSS 24.0. Non-parametric tests were applied to find the significant difference between average scores of JSPE-S and all sub-scales across gender, age, academic year and medical program. **Results:** The mean empathy score on JSPE-S was 66.7. Difference of JSPE-S overall empathy score between age-groups was statistically significant (p-value 0.02). Among the medical and dental students significant difference was found between average scores of perceptive taking and compassionate care. No correlation was found between empathy scores and gender. However, empathy scores were low during initial years of medical school, being the highest in fourth year and then declining again. **Conclusions:** It was concluded that empathy is associated with demographical factors. Among the medical and dental students' significant difference was found between average scores of perceptive taking and compassionate care. Although no difference in empathy scores was found between the two genders however, it declined as students gained more exposure to patients in their senior years.

INTRODUCTION

Empathy within professionalism raises constructive communication between physicians and patients, correlating with enhanced patient satisfaction, increased adherence, and improved clinical outcomes [1]. Establishing a robust doctor-patient bond is vital for delivering top-notch healthcare services, with the empathetic stance of healthcare providers towards their patients playing a crucial role [2]. Empathy, includes cognitive and emotional dimensions, which is pivotal in comprehending and forging deeper connections with patients. Cognitive empathy involves grasping patients, experiences and worries, coupled with effective communication skills, while the emotional aspect hinges on the capacity to share in the other person's feelings [3]. Clinical empathy is when healthcare professionals can grasp a patient's circumstances, viewpoints, and emotions effectively communicate with their understanding ensure it is correct and use that insight to assist the patient in a beneficial manner [4]. However, empathy is not inherent and can be influenced by various factors. Demography has

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a significant impact on empathy in medical education because of different factors such as age, gender [5, 6] personality traits [7, 8] and academic year [9]. Despite the undeniable significance of empathy, a substantial proportion of healthcare professionals appear to struggle with incorporating empathic communication into their daily practice [10]. Greater number of patients negatively affect the development of empathy among health professionals in the form of burnout. The development of empathetic skills should not be limited to an initial teaching goal but should also be pursued as an enduring aspect of a professional's continuous learning journey [11]. Previous studies have shown that medical school curriculum often prioritizes scientific knowledge and technical skills over the development of empathy among students. This shift towards a scientific approach may lead to a decline in empathy among medical students as they face the challenges of modern medicine [12]. Moreover, the hidden curriculum or organizational culture within medical education institutions may also contribute to fluctuations in empathy scores among students. In a study conducted by Iqbal *et al.*, it was discovered that there is a lack of agreement regarding the fluctuations in empathy levels throughout medical education [2]. Age is an important factor to consider, as individuals typically experience personal and cognitive development as they grow older. Furthermore, gender differences in empathy have been observed in previous studies, with women often displaying higher levels of empathy compared to men. Based on the existing literature, it is clear that empathy plays a crucial role in healthcare and that medical students may experience fluctuations in empathy levels throughout their education. Given the importance of empathy in healthcare, it is crucial to understand how empathy levels may vary among medical students based on factors such as age, gender and academic year.

This study was conducted to assess the empathy scores among medical and dental students and to correlate empathy scores with demographic features like age, gender and academic year.

METHODS

A cross-sectional study was conducted among medical and dental students at a private medical and dental college in Lahore from August to December 2023. This study was approved from Research ethics committee of Avicenna Medical College and Hospital Lahore (IRB-48/01/24/AVC). The Jefferson Scale of Physician Empathy- student version (JSPE-S) was administered to the participants after obtaining approval from the Institutional Review Board and ethical committee. This scale was chosen for its effectiveness in assessing empathy levels among medical and dental students. A purposive, non-probability sampling technique was utilized to select participants from the target population. Only the students from medical and dental programs were included, and they were invited to participate voluntarily. The target population included all students from the medical and dental programs, while students from nursing, physiotherapy, and other allied health sciences were excluded from the study. The total sample size of 324 was calculated using Open Epi Statistical Calculator [13] by taking 5% margin of error at 5%, and 95% CI. A structured questionnaire was used to collect data, which comprised of two sections. One section pertained to the socio-demographics such as age, gender, year of study, and program of study. The second section included the JSPE-S. In 2001, Hojat *et al.*, developed the JSPE-S, specifically tailored for patient care and medical education contexts [7]. This inventory comprises 20 questions evenly divided between positive and negative phrasing. Three sub-scales were identified: "perspective taking" (based on ten positively worded items), "compassionate care" (based on eight negatively worded items), and "standing in the patient's shoes" (based on two negatively worded items). Responses for each item were collected on a 5-point Likert scale ranging from "strongly agree" to "strongly disagree." Total scores range from 20 to 100, with higher scores indicating greater empathy and lower scores indicating lower empathy. Data analysis was done using SPSS 24.0. The p-value < 0.05 was considered as significant. Normality of data was checked and non-parametric tests (Mann Whitney U test and Kruskal Wallis Test) was applied to find the significant difference between average scores of JSPE-S and all sub-scales across gender, academic year and medical program.

RESULTS

The ratio of medical and dental students was 3:1. About 81 (25.0%) of the students participated in the study were enrolled in BDS and remaining 243 (75.0%) in MBBS program. About 30 (9.3%) of the students were in age-group 15-20 years, 231 (71.3%) were 20-25 years and 63 (19.4%) were in 25-30 years age-group. About 75 (23.1%) of the students were in final year, 66 (20.4%) were in fourth year, 52 (16.0%) were in third year, 42 (13.0%) were in second year and 31 (9.6%) were in first year. Remaining 58 (17.9%) of the students were doing house job. The mean empathy score on JSPE-S was 66.7. The average score of perceptive taking was 32.9 compassionate care was 26.3 and average score of standing in patient shoe was 7.5. The empathy score does not follow normal distribution (KS= 0.08, p-value = 0.00). Similarly, perceptive taking, compassionate care and standing in patient shoe do not follow normal distribution (KS= 0.10, p-value= 0.00; KS= 0.10, p-value= 0.00; KS= 0.25, p-value = 0.00). Non-parametric test was applied to test the significant difference between average

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scores of JSPE-S and all sub-scales across gender, academic year and medical program. Difference of JSPE-S overall empathy score between age-groups was significant at 5% as level of significance (table 1).

Table 1: Average JSPE-S Cores across Age, Gender, Program and Academic Year

Factor	Category	Mean + SD	p-value
Age	15-20 Years	65.23 + 12.53	0.02*
	20-25 Years	67.65 + 8.13	
	25-30 Years	63.73 + 11.89	
Gender	Male	66.14 + 9.46	0.98
	Female	66.85 + 9.60	
Program	MBBS	66.16 + 9.83	0.10
	BDS	68.17 + 8.47	
Academic Year	1st Year	64.16 + 8.58	0.45
	2nd Year	66.60 + 7.10	
	3rd Year	65.15 + 9.39	
	4th Year	67.62 + 9.97	
	5th Year	67.57 + 10.85	
	House Job	67.16 + 9.32	

There was significant difference in average scores of compassionate care among various age-groups. Statistically significant difference exists between average scores of perceptive taking and compassionate care across MBBS and BDS students (table 2).

Table 2: Average JSPE-S Subscale Scores across Age, Gender, Program and Academic Year

Factor	Category	Perceptive Taking		Compassionate Care		Standing in Patient Shoe	
		Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value
Age (years)	15-20	32.37 ± 6.98	0.06	25.73 ± 5.20	0.01*	7.13 ± 2.21	0.20
	20-25	33.35 ± 4.52		26.67 ± 3.58		7.64 ± 1.49	
	25-30	31.46 ± 6.20		25.11 ± 4.83		7.16 ± 1.95	
Gender	Male	32.78 ± 5.35	0.76	26.32 ± 4.11	0.79	7.41 ± 1.52	0.17
	Female	32.97 ± 5.07		26.23 ± 4.00		7.56 ± 1.78	
Program	MBBS	32.56 ± 5.35	0.05*	25.99 ± 4.25	0.03*	7.62 ± 1.62	0.07
	BDS	33.88 ± 4.56		27.16 ± 3.29		7.14 ± 1.81	
Academic Year	1st Year	31.23 ± 4.64	0.23	25.26 ± 4.13	0.30	7.68 ± 1.89	0.12
	2nd Year	32.95 ± 3.87		26.62 ± 3.32		7.02 ± 1.62	
	3rd Year	32.31 ± 5.44		25.48 ± 3.70		7.37 ± 1.70	
	4th Year	33.48 ± 5.27		26.68 ± 4.06		7.45 ± 1.75	
	5th Year	33.39 ± 5.80		26.68 ± 4.43		7.51 ± 1.72	
	House Job	32.93 ± 5.10		26.28 ± 4.06		7.90 ± 1.37	

DISCUSSION

Effective communication between patients and healthcare providers plays a crucial role in medical practice. Demonstrating empathy is a key foundation of the patient-provider relationship [14, 15]. This research sought to evaluate empathy levels among MBBS and BDS medical students, as well as their correlation with gender, age, and academic year. In this research, no significant distinction was observed in empathy scores between male and female students. Similarly, Benabbas reported same findings in Iran [16]. Different results were presented by Yeo, indicating higher empathy scores among male participants compared to female students [17]. Conversely, a study conducted in Indonesia revealed higher levels of empathy among female medical students compared to their male counterparts; however, this difference did not reach statistical significance [18]. Nasiri *et al.*, found that female medical students in their final year at Shiraz Medical School, as well as in a study conducted in Kuwait, demonstrated higher levels of empathy using the Persian version of JSPE [19, 20]. The observed gender difference may be attributed to factors such as "perspective-taking" [21] "heightened sensitivity of women in interpersonal relationships," and "their enhanced understanding of patients' emotional cues" [22,23] rather than solely being due to inherent ability differences between genders [24]. Our research found that during the initial three years of medical school, levels of empathy tend to be lower due to limited interaction with patients. Fourth-year students exhibited the highest levels of empathy. However, their empathy began to diminish as they gained more exposure. An investigation conducted in India highlighted a deficit in empathetic attitudes among male first-year medical students specifically [25]. In another research carried out in Kuwait, the study found that 4th-year medical students had the highest levels of empathy, with a minor decrease observed in later years [26]. A qualitative study conducted in the UK revealed that students perceived a tendency to develop desensitized and indifferent attitudes when regularly dealing with terminally ill patients, as a means of safeguarding their own emotional health. In contrast, educators associated ethical decline with heavy workloads, extended working hours, and overall job demands [27]. A multi-center research project carried out at eight medical schools in Pakistan, including both private and government institutions, discovered a decrease in the level of empathy as student advance through their medical education. However, the difference observed was relatively small. Furthermore, there was no discernible contrast between male and female students, aligning with our own research findings [28]. In comparing the overall empathy scores of students in different educational stages (preclinical vs clinical), it was observed that clinical phase students exhibited significantly higher total empathy scores than preclinical phase students. This could be due to senior students' increased exposure to patients, potentially influencing their understanding of the significance of nurturing patient relationships and

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recognizing empathy as a fundamental element in this context [29]. Research has been carried out in Faisalabad, Pakistan compared the empathy scores of medical students using an integrated modular-based curriculum with formal training in ethics and professionalism to those using a discipline-based curriculum without educational intervention. The study found that the empathy score was higher in the integrated modular group, with potential contributing factors including female predominance in this group as females are often perceived as more caring, kind-hearted, and affectionate [30]. Empathy was observed to decline with age according to our research findings. A longitudinal study carried out involved surveying medical students at the beginning of their course, and then again after 2, 4, and 6 years. The results indicated an increase in empathy levels as the students aged [31]. Meanwhile, a study conducted in Iran indicated a decrease in empathy with advancing age [32]. A scoping review studying the changes in student empathy throughout medical school revealed that four studies utilizing the JSPE-S indicated a decrease in empathy or significantly lower scores on empathy among older students [33, 37]. In our research, it was found that students in the dental program exhibited a greater degree of empathy compared to those in the MBBS program. Conversely, male dental students displayed lower levels of empathy than their counterparts in medical studies [38]. This difference could be attributed to the perception among male applicants for dental training programs that patient care in dentistry is more focused on technical aspects and therefore places less importance on interpersonal skills.

CONCLUSIONS

The empathy is associated with demographical factors to some extent. These factors have a crucial role in empathy building in a person. Although no difference in empathy scores was found between the two genders however, it declined as students gained more exposure to patients in their senior years. Educators need to recognize the significance of being role models. Engaging in thoughtful reflection can enhance the impact of positive role models and counteract the harmful influence of negative role models.

Authors Contribution

Conceptualization: SN
Methodology: FA, GJ, HN, ANA, MSN
Formal analysis: SN
Writing-review and editing: AM, R

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

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Original Article

Utility of Distal Loopogram Prior to Post Typhoid Ileostomy Reversal

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ABSTRACT

The Distal loopogram assesses distal bowel health pre-stoma reversal. Yet, its benefits for typhoid perforation patients require further evaluation. **Objective:** To assess the utility of distal loopogram before the ileostomy stoma reversal in patients of typhoid perforation. **Methods:** A comparative, cross-sectional study was conducted upon a sample of 76 patients of both gender with age from 13 to 70 years and being operated for reversal of post-typhoid perforation loop ileostomy with or without distal loopogram study at Liaquat University Hospital Jamshoro and Hyderabad. Non-consenting patients and the patients with deranged kidney function or comorbid conditions in which contrast material is contraindicated or patients allergic to contrast agent or having tendency of atopy to any allergens like patients of bronchial asthma and those who lost to follow up were excluded from the sample. **Results:** The loopogram accurately predicted anastomotic leakage and mucocutaneous separation in all cases during surgery. Bowel stricture was predicted in 66.7% of cases, and peristomal dermatologic problems in 50%. This highlights the loopogram's utility in anticipating surgical challenges, especially for critical issues like anastomotic leakage and mucocutaneous separation. **Conclusions:** It was concluded that distal loopogram was valuable for assessing post-typhoid ileostomy reversal patients, offering detailed small intestine images for identifying complications and enhancing surgical planning, thus improving outcomes.

INTRODUCTION

Typhoid fever, once the most common cause of fever worldwide, has almost been eliminated from developed countries because of sewage and water treatment facilities but remains a common disease and a major cause of morbidity and mortality in the third world countries [1]. The situation has recently worsened with the emergence and wide dissemination of multiple drug resistant strains of the organism in several countries throughout Asia. The spread of these organisms has been accompanied by case-fatality rates approaching those reported from the pre-antimicrobial treatment era [2]. The morbidity is thus highest in Asia with 93% of global episodes occurring in this region. Southeast Asia has an estimated incidence of 110 cases per 100 000 populations, which is the third highest incidence rate for any region [3]. Although population-based data from Pakistan are scarce, several hospital-based studies from different parts of the country have consistently shown a very high incidence of typhoid fever [4]. Intestinal perforation stands as a formidable and prevalent complication of typhoid fever, representing the second most common etiology of ideal perforations and comprising around 23% of total reported instances in developing countries [5]. Typically, the perforation happens around the third week. It usually occurs in one

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spot solitary in about 85% of cases. This happens because of an infection in Peyer's patches, which leads to ulcers along the inner border of the intestine, close to the valve that connects the small intestine to the large intestine. Perforation may not be noticed early, especially in patients who are already very sick. When intestinal bacteria leak out, it can cause a serious infection called bacterial peritonitis. This makes the condition a common surgical emergency [6]. The standard treatment for secondary peritonitis due to a hole in the intestines involves resuscitation followed by surgery called laparotomy. During this surgery, the hole in the intestine is either stitched closed directly, or a part of the intestine is removed and the ends are stitched back together, or a temporary opening called a stoma is made in the abdomen. The treatment choice depends on factors like where and how many holes there are, how bad the infection is, and how sick the patient is [7]. Ileostomy, a frequently performed surgical procedure, carries lower mortality rate due to the early start of enteral feeding and nutritional built up [8, 9]. However, stoma formation and later its closure is not devoid of complications and adverse events such as stoma necrosis, stoma retraction or stoma prolapse may occur [10]. It is customary to perform distal loopogram contrast study before stoma reversal to detect distal obstruction or pathology like stricture, growth, kinking of distal loop or fecal impaction and continuity of distal loops as presence of any of the findings are associated with higher rates of post ileostomy reversal complications [11]. However, presence of any of these distal pathology are unlikely findings, especially in patients undergoing Ileostomy reversal made secondary to typhoid perforation. At the same time distal loopogram is associated with significant risk due to contrast material, especially in patients with impaired kidney function, old age population, long standing hypertension, Diabetes mellitus & its associated cost and delay in treatment [12]. This study was meant to assess the risks and benefits associated with the routine use of distal loopogram in patients undergoing ileostomy reversal made typhoid ideal perforation as the data regarding its use in post typhoid perforation stoma closure are not standardized in literature. Distal loopogram, also known as computed tomography enterography (CTE), is a non-invasive imaging technique that utilizes computed tomography to create detailed images of the small intestine, which is performed with an intention to assess patency and integrity of distal bowel prior to closure of stoma in order to subvert lethal complications associated with loss of it. However, the process put an additional burden on the healthcare setup and patient apart from complications associated to it. Since data regarding the use of distal loopogram in patients of post typhoid perforation stoma closure were either insufficient in literature or do not put a conclusive evidence regarding its utility.

This study was conducted to assess the utility of distal loopogram before the ileostomy stoma reversal in patients of typhoid perforation.

METHODS

A cross-sectional study was conducted at the Department of General Surgery, Unit 3, Liaquat University Hospital in Jamshoro and Hyderabad, from Jan 2022 to Dec 2022. Sample size was calculated using OpenEpi sample size calculator with estimated incidence of complications found in distal loopogram before ileostomy reversal as 8.69% [13] and a margin of error of 5% and a confidence level of 95%. A total of 76 cases undergoing reversal of post-typhoid perforation loop ileostomy, aged between 13 to 70 years, and of either gender were included in the study using a non-probability, consecutive sampling technique while patients with deranged kidney function or contraindications to contrast material, those allergic to contrast agents, individuals with a tendency towards atopy, and those lost to follow-up or not consenting to participate were excluded from the study. The study was approved by Institutional ERC vide letter no. LUMHS/REC/-84, dated; 03/05/2021. Patients were divided into two groups with equal number of participants like 38 in Group A, who underwent a distal loopogram prior to ileostomy reversal as compared to Group B. Both groups received similar preoperative bowel preparation and antibiotic prophylaxis. Surgical procedures involved hand-sewn end-to-end anastomosis with operative findings noted. Postoperatively, patients were monitored for complications, including anastomosis leakage, intestinal obstruction, and wound infection. Patients who underwent contrast radiology were assessed for issues related to the distal loopogram. Data analysis was performed using SPSS version 24.0, with qualitative data expressed as number and percentage and quantitative data as mean and standard deviation. Statistical significance was determined using Pearson's coefficient and chi-square tests, with a p-value of ≤ 0.05 considered significant.

RESULTS

The demographic profiles of participants, categorized into Group A and Group B. The mean age of participants in both groups was 32.88 years, with a standard deviation of 8.29 years. When considering gender distribution, Group A comprised 27 males (71.1%) and 11 females (28.9%), while Group B had 28 males (73.7%) and 10 females (26.3%). Regarding the area of residence, the majority of participants in both groups hailed from rural areas, with 29 (76.3%) in Group A and 30 (78.9%) in Group B, whereas the remaining participants resided in urban areas, accounting for 9 (23.7%) in Group A and 8 (21.1%) in Group B (table 1).

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Table 1: Demographic Profiles of Participants

Demographic Variables	Group A	Group B
Mean Age (Years)		
Overall Age	32.88 ± 8.29	32.88 ± 8.29
Mean Age of Males (Years)	44.78 ± 9.88	44.78 ± 9.88
Mean Age of Female (Years)	27.24 ± 15.85	27.24 ± 15.85
Gender Distribution		
Male	27 (71.1%)	28 (73.7%)
Female	11 (28.9%)	10 (26.3%)
Area Of Residence		
Rural	29 (76.3%)	30 (78.9%)
Urban	9 (23.7%)	8 (21.1%)

The majority of participants in both groups had a loop ileostomy, with 24 (63.16%) in Group A and 27 (71.05%) in Group B, while the remaining participants had an end ileostomy. Most participants in both groups had a single perforation, accounting for 28 (73.68%) in Group A and 30 (78.95%) in Group B. The proportion of participants with dual perforations was higher in Group B 9 (23.68%) compared to Group A 6 (15.79%). However, the occurrence of multiple perforations was minimal in both groups. The mean time elapsed since ileostomy till reversal was slightly longer in Group A, at 19 weeks and 6 days as compared to 15 weeks and 2 days in Group B. Conversely, the mean postoperative hospital stay after reversal was shorter in Group A, at 5 days and 2 days, compared to 6 days and 3 days in Group B. (table 2)

Table 2: Variables Related to Ileostomy Comparison of Group A and Group B

Variables	Group A	Group B
Type Of Ileostomy		
Loop Ileostomy	24 (63.16%)	27 (71.05%)
End Ileostomy	14 (36.84%)	11 (28.95%)
Number of Typhoid Perforations at Operation		
Single	28 (73.68%)	30 (78.95%)
Dual	6 (15.79%)	9 (23.68%)
Multiple	2 (5.26%)	1 (2.63%)
Mean Time Elapsed Since Ileostomy till Reversal	19 Weeks ± 61	5 Weeks ± 2
Mean Postoperative Hospital Stay After Reversal	5 Days ± 2	6 Days ± 3

The abnormal findings during surgery between patients in Group A and Group B. Group A had abnormality in 18 (47.37%), whereas Group B exhibited abnormalities in a higher proportion, with 32 (84.21%). Both groups displayed similar patterns of abnormalities, with the presence of anastomotic leakage being the most common. Other abnormalities included bowel obstruction, perforation, stricture, infection, peristomal dermatologic problems, mucocutaneous separation, and pyoderma gangrenosum. These findings suggest a higher incidence of surgical complications in patients from Group B compared to those in Group A. (table 3)

Table 3: Abnormal Findings during Surgery in Group A and Group B

Abnormal Findings	Group A	Group B
Presence Of Anastomotic Leakage	5 (13.16%)	9 (23.68%)
Bowel Obstruction	2 (5.26%)	5 (13.16%)
Bowel Perforation	1 (2.63%)	2 (5.26%)
Bowel Stricture	3 (7.89%)	4 (10.53%)
Ischemia/Necrosis	0	2 (5.26%)
Infection	4 (10.53%)	8 (21.05%)
Peristomal Dermatologic Problems	2 (5.26%)	4 (10.53%)
Mucocutaneous Separation	1 (2.63%)	2 (5.26%)
Pyoderma Gangrenosum	0	1 (2.63%)
Total	18 (47.37%)	32 (84.21%)

Complications, such as the presence of anastomotic leakage and mucocutaneous separation were accurately predicted by the loopogram as their occurrence during surgery in 100% of cases. For bowel stricture, the loopogram predicted the abnormality in 66.7% of cases, while for peristomal dermatologic problems, it predicted the abnormality in 50% of cases. This underscore the utility of the loopogram in predicting potential problems during surgery, particularly for complications such as anastomotic leakage and mucocutaneous separation (table 4).

Table 4: Comparison of Abnormal Findings Detected During Surgery and Predicted by Loopogram

Abnormal Findings	Found During Surgery	Predicted By Loopogram
Presence of Anastomotic Leakage	5	5 (100%)
Bowel Structure	3	2 (66.7%)
Peristomal Dermatologic Problems	2	1 (50%)
Mucocutaneous Separation	1	1 (100%)

DISCUSSION

Typhoid fever is a bacterial infection caused by *Salmonella typhi* that can result in severe damage to the intestinal wall, leading to intestinal perforation and peritonitis. Once the infection has been treated and the intestinal damage has healed, the ileostomy can be reversed, allowing the patient to resume normal bowel function. The utility of distal loopogram prior to post-typhoid ileostomy reversal lies in the fact that it can provide valuable information on the condition of the small intestine, including the presence of adhesions, strictures, or other abnormalities that may impact the success of the reversal procedure. In the United States and Canada, the number of temporary stomas being created is decreasing because of better surgical techniques like planned laparotomy and continuous closed peritoneal lavage, which help reduce infections and deaths. Also, newer surgical methods mean fewer permanent stomas are needed [14, 15]. Anastomotic leakage emerged as the most common complication in both groups, with a prevalence of 13.16% in Group A and 23.68% in Group B. This finding is consistent with existing

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literature, as anastomotic leakage is recognized as a frequent complication following ileostomy reversal, attributed to factors such as surgical technique, patient comorbidities, and postoperative care protocols [16]. Bowel obstruction and infection were also prevalent complications in both groups, with higher incidences observed in Group B. This aligns with prior research indicating that bowel obstruction and postoperative infections are common complications associated with gastrointestinal surgery and can contribute to morbidity and prolonged hospital stays [17, 18]. In our study, the loopogram demonstrated a high accuracy in predicting the presence of certain complications, notably anastomotic leakage and mucocutaneous separation, with a 100% prediction rate while it showed a moderate predictive capability for bowel stricture, correctly identifying this abnormality in 66.7% of cases. This indicates that the loopogram effectively identified these issues before surgery. Our results align with previous research demonstrating the utility of the loopogram in predicting surgical complications. Studies conducted in other countries have also reported high accuracy rates for the loopogram in anticipating complications such as anastomotic leakage and bowel strictures [19-21]. However, the loopogram predictive ability was relatively lower for peristomal dermatologic problems, with a prediction rate of 50%. Despite this, the loopogram still provided some insight into the likelihood of encountering peristomal dermatologic issues during surgery. These variations in predictive performance may exist across different healthcare settings and patient populations [22]. Several studies have investigated the use of distal loopogram prior to post-typhoid ileostomy reversal, with promising results [23, 24]. For example, a study reported that distal loopogram was able to accurately identify significant small bowel abnormalities in patients with a history of typhoid fever, with a sensitivity of 100% and a specificity of 97%. The authors of the study concluded that distal loopogram can be a valuable tool in the evaluation of patients undergoing post-typhoid ileostomy reversal, particularly in those with a history of complicated typhoid fever [25]. Another study published in the Journal of Surgical Research found that distal loopogram was able to accurately detect the presence of adhesions and other small bowel abnormalities in patients undergoing post-typhoid ileostomy reversal, with a sensitivity of 86% and a specificity of 96%. The authors of the study concluded that distal loopogram can aid in the identification of potential complications during the reversal procedure, allowing for better surgical planning and improved patient outcomes [26]. Despite its many benefits, distal loopogram does have some limitations. For example, it may not be able to detect very small lesions, and it may not be able to provide a definitive diagnosis for abnormalities detected on the imaging. Additionally, like all medical procedures, distal loopogram does carry some risks, such as exposure to radiation [27].

CONCLUSIONS

The loopogram accurately predicted complications like anastomotic leakage and mucocutaneous separation in all cases during surgery. It also identified bowel stricture in 66.7% and peristomal dermatologic problems in 50% of cases. This highlights the loopogram's value in anticipating surgical challenges, especially for critical issues like anastomotic leakage and mucocutaneous separation.

Authors Contribution

Conceptualization: AR
Methodology: SNK
Formal analysis: AR, AAT, AHA, MBR
Writing-review and editing: AAT, SNK, AHA, MBR, ZA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Troponin I, Hyperlipidemia and Obesity as Predictor of Cardiovascular Complications: A Cross Sectional Study

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ABSTRACT

High levels of Troponin I, cholesterol, triglycerides, Low Density Lipoprotein (LDL), High Density Lipoprotein (HDL) and Body Mass Index (BMI) are predictor of cardiac complications. **Objective:** To investigate the predictive efficacy of Troponin I, BMI, and lipid profiles in detecting cardiovascular problems. **Methods:** 300 male and female individuals were selected for current study. 100 normal individuals were in Control Group A, while 100 participants were placed in Group B all the individuals of Group B have the indications of different cardiac medical complications. BMI, systolic, diastolic blood pressure, Troponin I, cholesterol, triglycerides, LDL, HDL levels were measured respectively. **Results:** In present study BMI, systolic blood pressure, diastolic blood pressure, Troponin I, cholesterol, triglycerides, LDL, HDL blood serum levels of male and female in Group A and Group B were measured, the comparative analysis of above biomarkers showed a significant p-Value ≤ 0.05 change (0.02 ± 0.01, 183.01 ± 0.02, 120.01 ± 0.02, 87.01 ± 0.03, 44.01 ± 0.01), (0.02 ± 0.01, 172.01 ± 0.02, 130.01 ± 0.01, 88.01 ± 0.03, 42.01 ± 0.04), (0.39 ± 0.04, 272.01 ± 0.02, 180.01 ± 0.01, 138.01 ± 0.03, 37.01 ± 0.01) and (0.37 ± 0.04, 282.01 ± 0.02, 184.01 ± 0.01, 141.01 ± 0.03, 36.01 ± 0.01) were measured respectively. **Conclusions:** The present study found that there were notable significant p-value <0.05 differences in the blood serum levels of BMI, systolic and diastolic blood pressure, Troponin I, cholesterol, triglycerides, LDL, and HDL in both the male and female groups in Groups A and B.

INTRODUCTION

Obesity is a growing global health concern that affects both industrialized and developing nations [1]. It is a finding of different studies that obesity has increased more than 39 percent in all over the world according to the WHO. Cardiovascular illnesses and obesity are related to one another. It has also been demonstrated that the correlation between obesity and dyslipidemias, sleep apnea syndrome, diabetes mellitus, and hypertension raises the risk of cardiovascular diseases [2]. The skeletal muscles and heart both include members of the protein family known as troponin I. It is a component of the protein complex known as troponin, which forms thin myofilaments with actin to keep the actin-tropomyosin complex in place [2,3]. Troponin is a structural protein unique to the heart that is recommended for use in the diagnosis and management of acute coronary syndrome.

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Troponin I prevent myosin from adhering to actin in relaxed muscle. Low-grade elevations in cardiac troponin are strongly associated with incident cardiovascular disease and death in people with existing cardiovascular disease [4]. Age-related increases in cardiac troponin I concentrations in people without overt signs of coronary heart disease indicate silent myocardial damage [5]. Primary care physicians frequently diagnose and treat hyperlipidemia in an effort to prevent Cardiovascular Disease (CVD). It is commonly known that hyperlipidemia poses a significant risk for cardiovascular disease [6]. Elevated triglycerides and cholesterol, or both are referred to as hyperlipidemia [7]. Elevations in fasting total cholesterol that may or may not be correlated with elevated triglyceride concentrations are referred to as hyperlipidemia. Lipids are transported by lipoproteins, which are particles that are not soluble in plasma. As a result, lipoprotein abnormalities are also used to categorize cases of hyperlipidemia [8]. Cardiovascular Diseases (CVDs) remain the leading cause of death worldwide, and they pose a substantial public health problem in Pakistan. CVDs account for roughly 32% of all fatalities worldwide, with an estimated 17.9 million people dying each year, according to the World Health Organization (WHO). In Pakistan, CVDs account for 19% of all fatalities, indicating a significant health burden [9]. The rising incidence of risk factors such as hypertension, diabetes, and obesity exacerbate this burden. The economic consequences are as severe, with the expense of cardiovascular healthcare putting a significant drain on Pakistan's resources. According to studies, the incidence of key risk factors such as hypertension, diabetes, obesity, and smoking is on the rise in Pakistan, emphasizing the need of tackling this issue [10,11]. Various researches have determined that health care practitioners are concerned about hyperlipidemia due to the documented relationship between lipid concentrations and the risk of Cardiovascular Disease (CVD), which is the leading cause of death worldwide [12]. After concluding that troponin is a structural protein unique to the heart, recommendations suggest using it to diagnose and treat acute coronary syndrome [13,14]. Newly developed technologies enable precise assessment of low circulating troponin concentrations in the general population. Increased levels of C-reactive protein and fibrinogen, diabetes, insulin resistance, dyslipidemia, and hypertension are all associated with obesity and increase the risk of CVD events [15].

The objectives of present study were to identify the relationship between, Troponin I, BMI and components of lipid profile with cardiac complications in male and female individuals. The objective of this study is to investigate the predictive efficacy of Troponin I, BMI, and lipid profiles in detecting cardiovascular problems. This study was conducted to address the significant gap in data regarding the predictive accuracy of biomarkers like Troponin I for cardiovascular complications in populations at high risk due to obesity and hyperlipidemia.

METHODS

Present study was cross-sectional and conducted in medical and cardiac units of Ghurki Trust and Teaching Hospital from March 2023 to November 2023. The Ethical Approval Clearance Certificate Ref No. 2023/1A was granted by Ethical Review Committee, Faculty of Biological Sciences, Lahore University of Biological and Applied Sciences. The aims and objectives of present study were to identify the relationship between, Troponin I, BMI and components of lipid profile with cardiac complications in male and female individuals. Participants were chosen using stratified random sampling to achieve varied representation across age and sex categories within the community. The sample size was calculated using the Cochran Formula, with the goal of achieving 80% power and a 95% confidence level. This is a clinical cross sectional study where in the patient's initial symptoms were noted at the time of presentation, and additional tests were performed using a calorimetry kit to measure the levels of cholesterol, LDL, triglycerides, and HDL using blood samples that were collected. All subjects in Groups A and B had their raw data collected using a Performa and a medical history questionnaire. BMI, systolic, diastolic blood pressure, Troponin I, cholesterol, triglycerides, LDL, HDL levels were considered as inclusive criteria respectively. Cardiac medical complication like myocardial infarction, thrombosis, deep vein thrombosis, stroke etc. were exclusive criteria. 300 male and female individuals were selected for current study. 100 normal individuals were in control Group A, while 100 participants were placed in Group B all the individuals of Group B have the indications of different cardiac medical complications. BMI, systolic, diastolic blood pressure, Troponin I, cholesterol, triglycerides, LDL, HDL levels were measured respectively. Parameters were measured by using spectrophotometry kit and the regent method. Through a series of linked reactions that oxidize cholesterol's 3-OH group and hydrolyze cholesteryl esters, enzyme assays of cholesterol are performed in blood or plasma. One of the reaction byproducts, H2O2, is measured in a process that produces color and is catalyzed by peroxidase. Glycerol is created by the hydrolysis of triglycerides. One can measure serum HDL directly. The technique measures HDL cholesterol using polyethylene glycol-coupled cholesteryl esterase and cholesterol oxidase, and it forms complexes with Apolipoprotein B (ApoB) containing lipoproteins using

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sulfated alpha-cyclodextrin when Mg+2 is present. LDL cholesterol is determined by measuring total cholesterol, HDL cholesterol, and triglycerides. Using SPSS version 20.0, the bio-statistical operations were performed on all raw data collected, and all parameters were characterized by using standard mean deviation and significant (p-value < 0.05) regression.

RESULTS

In table 1, the results of the present study are systematically presented. The sociodemographic characteristics of normal male individuals are outlined, including gender, age, smoking habits, alcohol consumption, family history of cardiac complications, and lifestyle. The mean and standard deviation values for these characteristics are as follows: gender (67.01 ± 0.03), age (54.01 ± 0.01), smoking (06.01 ± 0.02), alcoholic habit (02.01 ± 0.01), family history (03.01 ± 0.03), and lifestyle (60.01 ± 0.02). Additionally, the biological parameters of males in Group A are detailed, comprising BMI (19.01 ± 0.01 kg/m^2), systolic blood pressure (124.01 ± 0.01 mmHg), diastolic blood pressure (83.01 ± 0.01 mmHg), Troponin I levels (0.02 ± 0.01 ng/mL), cholesterol levels (183.01 ± 0.02 mg/dL), triglycerides levels (120.01 ± 0.02 mg/dL), LDL levels (87.01 ± 0.03 mg/dL), and HDL levels (44.01 ± 0.01 mg/dL).

Table 1: Group A Normal Male Individuals (n=67)

Variables	Units / Symptoms	Mean ± SD	p-Value
Gender	Male	67.01 ± 0.03	0.03
Age	40-60 years	54.01 ± 0.01	0.01
Smoking	Rarer	06.01 ± 0.02	0.02
Alcoholic	Rarer	02.01 ± 0.01	0.01
Family history	Little	03.01 ± 0.03	0.03
Lifestyle	Active	60.01 ± 0.02	0.02
BMI	kg/m^2	19.01 ± 0.01	0.01
Systolic BP	mmHg	124.01 ± 0.01	0.01
Diastolic BP	mmHg	83.01 ± 0.01	0.01
Troponin-I Levels	ng/mL	0.02 ± 0.01	0.01
Cholesterol Levels	mg/dL	183.01 ± 0.02	0.02
Triglycerides Levels	mg/dL	120.01 ± 0.02	0.02
LDL Levels	mg/dL	87.01 ± 0.03	0.03
HDL Levels	mg/dL	44.01 ± 0.01	0.01

The figure 1 graph depicts the mean values and standard deviations for various sociodemographic and health parameters such as age, smoking, alcohol consumption, family history, lifestyle, and multiple clinical measurements such as BMI, blood pressure, and lipid levels among healthy males in Group A.

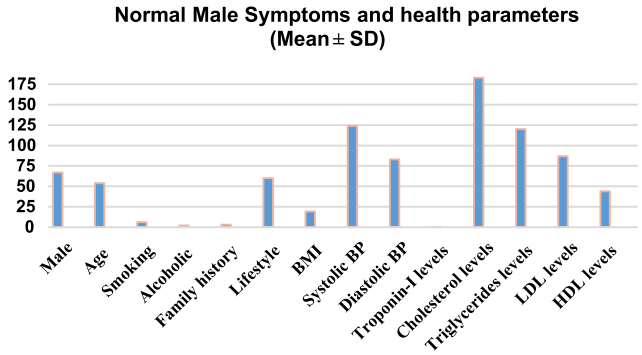

Figure 1: Distribution of Sociodemographic and Health Parameters in Group A Normal Male Individuals

In Table 2, the sociodemographic characteristics of normal female individuals are presented, encompassing variables such as gender, age, smoking habits, alcohol consumption, family history of cardiac complications, and lifestyle. The mean and standard deviation values for these characteristics are as follows: gender (33.01 ± 0.01), age (54.01 ± 0.02), smoking (01.01 ± 0.01), alcoholic habit (00.01 ± 0.01), family history (02.01 ± 0.01), and lifestyle (30.01 ± 0.04). Additionally, the blood serum levels for female individuals in Group A are provided, including BMI (17.01 ± 0.01 kg/m^2), systolic blood pressure (114.01 ± 0.01 mmHg), diastolic blood pressure (73.01 ± 0.01 mmHg), Troponin-I levels (0.02 ± 0.01 ng/mL), cholesterol levels (172.01 ± 0.02 mg/dL), triglycerides levels (130.01 ± 0.01 mg/dL), LDL levels (88.01 ± 0.03 mg/dL), and HDL levels (42.01 ± 0.04 mg/dL).

Table 2: Group A Normal Female Individuals (n=33)

Variables	Units / Symptoms	Mean ± SD	p-Value
Gender	Male	33.01 ± 0.01	0.01
Age	40-60 years	54.01 ± 0.02	0.02
Smoking	Rarer	01.01 ± 0.01	0.01
Alcoholic	Rarer	00.01 ± 0.01	0.01
Family history	Little	02.01 ± 0.01	0.01
Lifestyle	Active	30.01 ± 0.04	0.04
BMI	kg/m^2	17.01 ± 0.01	0.01
Systolic BP	mmHg	114.01 ± 0.01	0.01
Diastolic BP	mmHg	73.01 ± 0.01	0.01
Troponin-I Levels	ng/mL	0.02 ± 0.01	0.01
Cholesterol Levels	mg/dL	172.01 ± 0.02	0.02
Triglycerides Levels	mg/dL	130.01 ± 0.01	0.01
LDL Levels	mg/dL	88.01 ± 0.03	0.03
HDL Levels	mg/dL	42.01 ± 0.04	0.04

The figure 2 shows similar sociodemographic and health statistics as Figure 1, but for normal females in Group A. It shows mean values and standard deviations, allowing for a comparison of health profiles across genders in the control group.

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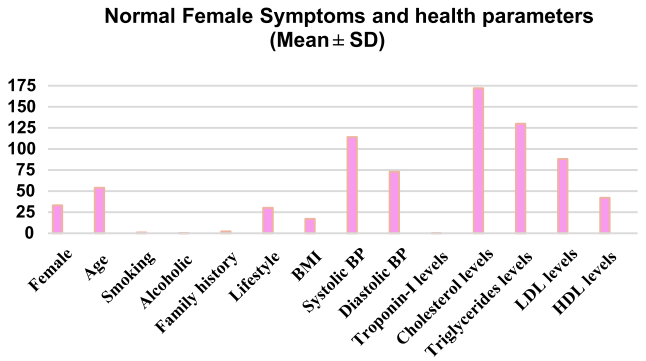

Figure 2: Distribution of Sociodemographic and Health Parameters in Group A Normal Female Individuals

In table 3 Sociodemographic factors include gender, with a predominance of males (57.01 ± 0.04), and age, with the majority falling within the 40-60 years range (54.01 ± 0.01). Smoking habits are represented by the majority being smokers (46.01 ± 0.03), while alcohol consumption is less common, denoted as rarer (12.01 ± 0.01). High family history prevalence (33.01 ± 0.01) and an inactive lifestyle (47.01 ± 0.04) are also notable among the studied population. In terms of clinical parameters, the table delineates BMI (27.01 ± 0.04 kg/m2), systolic blood pressure (140.01 ± 0.02 mmHg), diastolic blood pressure (89.01 ± 0.02 mmHg), Troponin-I levels (0.39 ± 0.04 ng/mL), cholesterol levels (272.01 ± 0.02 mg/dL), triglycerides levels (180.01 ± 0.01 mg/dL), LDL levels (138.01 ± 0.03 mg/dL), and HDL levels (37.01 ± 0.01 mg/dL).

Table 3: Group A Male Individuals with Cardiac Complications (n=57)

Variables	Units / Symptoms	Mean ± SD	p-Value
Gender	Male	57.01 ± 0.04	0.04
Age	40-60 years	54.01 ± 0.01	0.01
Smoking	Majority	46.01 ± 0.03	0.03
Alcoholic	Rarer	12.01 ± 0.01	0.01
Family history	High	33.01 ± 0.01	0.01
Lifestyle	Inactive	47.01 ± 0.04	0.04
BMI	kg/m^2	27.01 ± 0.04	0.04
Systolic BP	mmHg	140.01 ± 0.02	0.02
Diastolic BP	mmHg	89.01 ± 0.02	0.02
Troponin-I Levels	ng/mL	0.39 ± 0.04	0.04
Cholesterol Levels	mg/dL	272.01 ± 0.02	0.02
Triglycerides Levels	mg/dL	180.01 ± 0.01	0.01
LDL Levels	mg/dL	138.01 ± 0.03	0.03
HDL Levels	mg/dL	37.01 ± 0.01	0.01

The figure 3 graph shows comprehensive health data for male Group B members with cardiac problems. The metrics include BMI, systolic and diastolic blood pressure, Troponin I, cholesterol, triglyceride, LDL, and HDL values.

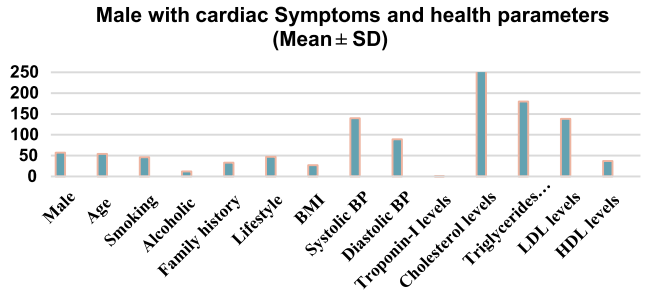

Figure 3: Health Parameters in Group B Males with Cardiac Complications

In table 4, the sociodemographic characteristics of female patients with cardiac complications are presented, including gender, age, smoking, alcohol consumption, family history, and lifestyle levels. The mean and standard deviation values for these characteristics are as follows: gender (43.01 ± 0.01), age (54.01 ± 0.01), smoking (16.01 ± 0.01), alcoholic habit (0.00 ± 0.01), family history (32.01 ± 0.01), and lifestyle (40.01 ± 0.02). Additionally, biological parameters of female individuals with cardiac complications are displayed in Table 4, encompassing BMI, systolic blood pressure, diastolic blood pressure, Troponin-I levels, cholesterol levels, triglycerides levels, LDL levels, and HDL levels. The blood serum levels for these parameters in Group A are recorded as follows: BMI (28.01 ± 0.04 kg/m2), systolic blood pressure (140.01 ± 0.02 mmHg), diastolic blood pressure (90.01 ± 0.02 mmHg), Troponin-I levels (0.37 ± 0.04 ng/mL), cholesterol levels (282.01 ± 0.02 mg/dL), triglycerides levels (184.01 ± 0.01 mg/dL), LDL levels (141.01 ± 0.03 mg/dL), and HDL levels (36.01 ± 0.01 mg/dL).

Table 4: Group B Female Individuals with Cardiac Complications (n= 43)

Variables	Units / Symptoms	Mean ± SD	p-Value
Gender	Female	43.01 ± 0.01	0.01
Age	40-60 years	54.01 ± 0.01	0.01
Smoking	Low	16.01 ± 0.01	0.01
Alcoholic	Non	0.00 ± 0.01	0.01
Family history	High	32.01 ± 0.01	0.01
Lifestyle	Inactive	40.01 ± 0.02	0.02
BMI	kg/m^2	28.01 ± 0.04	0.04
Systolic BP	mmHg	140.01 ± 0.02	0.02
Diastolic BP	mmHg	90.01 ± 0.02	0.02
Troponin-I Levels	ng/mL	0.37 ± 0.04	0.04
Cholesterol Levels	mg/dL	282.01 ± 0.02	0.02
Triglycerides Levels	mg/dL	184.01 ± 0.01	0.01
LDL Levels	mg/dL	141.01 ± 0.03	0.03
HDL Levels	mg/dL	36.01 ± 0.01	0.01

The figure 4 displays the health parameters of females in Group B who have cardiac problems. It presents a clear visual depiction of mean values and standard deviations for the same set of clinical measures as in Figure 3, but customized to the female subgroup.

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The figure 4 displays the health parameters of females in

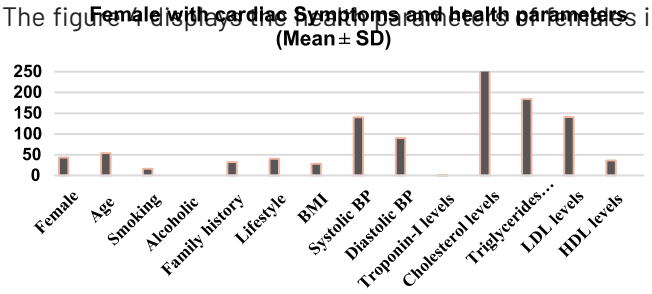

Figure 4: Health Parameters in Group B Female Patients with Cardiac Complications

In table 5, the characteristics of individuals with cardiac complications are stratified by gender and treatment groups (Groups A and B). The table presents the mean and standard deviation values for various variables. For male individuals in Group A, the mean and standard deviation values are as follows: age (67.01 ± 0.03 years), smoking (6.01 ± 0.02), alcoholic habits (2.01 ± 0.01), family history (3.01 ± 0.03), lifestyle (60.01 ± 0.02), BMI (19.01 ± 0.01 kg/m2), systolic blood pressure (124.01 ± 0.01 mmHg), diastolic blood pressure (83.01 ± 0.01 mmHg), Troponin-I levels (0.02 ± 0.01 ng/mL), cholesterol levels (183.01 ± 0.02 mg/dL), triglycerides levels (120.01 ± 0.02 mg/dL), LDL levels (87.01 ± 0.03 mg/dL), and HDL levels (44.01 ± 0.01 mg/dL). For female individuals in Group A, the corresponding values are: age (33.01 ± 0.01 years), smoking (1.01 ± 0.01), alcoholic habits (0.01 ± 0.01), family history (2.01 ± 0.01), lifestyle (30.01 ± 0.04), BMI (17.01 ± 0.01 kg/m2), systolic blood pressure (114.01 ± 0.01 mmHg), diastolic blood pressure (73.01 ± 0.01 mmHg), Troponin-I levels (0.02 ± 0.01 ng/mL), cholesterol levels (172.01 ± 0.02 mg/dL), triglycerides levels (130.01 ± 0.01 mg/dL), LDL levels (88.01 ± 0.03 mg/dL), and HDL levels (42.01 ± 0.04 mg/dL). For male individuals in Group B, the values are: age (57.01 ± 0.04 years), smoking (46.01 ± 0.03), alcoholic habits (12.01 ± 0.01), family history (33.01 ± 0.01), lifestyle (47.01 ± 0.04), BMI (27.01 ± 0.04 kg/m2), systolic blood pressure (140.01 ± 0.02 mmHg), diastolic blood pressure (89.01 ± 0.02 mmHg), Troponin-I levels (0.39 ± 0.04 ng/mL), cholesterol levels (272.01 ± 0.02 mg/dL), triglycerides levels (180.01 ± 0.01 mg/dL), LDL levels (138.01 ± 0.03 mg/dL), and HDL levels (37.01 ± 0.01 mg/dL). For female individuals in Group B, the corresponding values are: age (43.01 ± 0.01 years), smoking (16.01 ± 0.01), alcoholic habits (0.00 ± 0.01), family history (32.01 ± 0.01), lifestyle (40.01 ± 0.02), BMI (28.01 ± 0.04 kg/m2), systolic blood pressure (140.01 ± 0.02 mmHg), diastolic blood pressure (90.01 ± 0.02 mmHg), Troponin-I levels (0.37 ± 0.04 ng/mL), cholesterol levels (282.01 ± 0.02 mg/dL), triglycerides levels (184.01 ± 0.01 mg/dL), LDL levels (141.01 ± 0.03 mg/dL), and HDL levels (36.01 ± 0.01 mg/dL). A remarkable significant (p-value < 0.05) changes were seen in between the variables of each group.

Table 5: Comparative Analysis of Group A and Group B Male and Female Individuals

Variables	Units / Symptoms	(Mean ± SD) Male G-A	(Mean ± SD) Female G-A	(Mean ± SD) Male G-B	(Mean ± SD) Female G-B
Gender	Male	67.01 ± 0.03	33.01 ± 0.01	57.01 ± 0.04	43.01 ± 0.01
Age	40-60 years	54.01 ± 0.01	54.01 ± 0.02	54.01 ± 0.01	54.01 ± 0.01
Smoking	Majority	06.01 ± 0.02	01.01 ± 0.01	46.01 ± 0.03	16.01 ± 0.01
Alcoholic	Rarer	02.01 ± 0.01	00.01 ± 0.01	12.01 ± 0.01	0.00 ± 0.01
Family history	High	03.01 ± 0.03	02.01 ± 0.01	33.01 ± 0.01	32.01 ± 0.01
Lifestyle	Inactive	60.01 ± 0.02	30.01± 0.04	47.01 ± 0.04	40.01 ± 0.02
BMI	Kg/m^2	19.01 ± 0.01	17.01 ± 0.01	27.01 ± 0.04	28.01 ± 0.04
Systolic BP	mmHg	124.01 ± 0.01	114.01 ± 0.01	140.01 ± 0.02	140.01 ± 0.02
Diastolic BP	mmHg	83.01 ± 0.01	73.01 ± 0.01	89.01 ± 0.02	90.01 ± 0.02
Troponin-I levels	ng/mL	0.02 ± 0.01	0.02 ± 0.01	0.39 ± 0.04	0.37 ± 0.04
Cholesterol levels	mg/dL	183.01 ± 0.02	172.01 ± 0.02	272.01 ± 0.02	282.01 ± 0.02
Triglycerides levels	mg/dL	120.01 ± 0.02	130.01 ± 0.01	180.01 ± 0.01	184.01 ± 0.01
LDL levels	mg/dL	87.01 ± 0.03	88.01 ± 0.03	138.01 ± 0.03	141.01 ± 0.03
HDL levels	mg/dL	44.01 ± 0.01	42.01 ± 0.04	37.01 ± 0.01	36.01 ± 0.01

DISCUSSION

D. Johnson *et al.*, in 2019 concluded in their study that Cardiac Troponin I (cTnI), a benchmark for detecting myocardial damage, was recently found to predict acute myocardial infarction or mortality in individuals with unstable Coronary Heart Disease (CHD). Cardiac TnI concentrations rise with age in people with no clinical indications of CHD, indicating silent myocardial damage [16]. Obesity, which is defined by excessive amounts of adipose tissue (body fat), might raise your chance of developing hyperlipidemia. Excess weight promotes inflammation, disrupts metabolism, and leads to insulin resistance. Researchers assume that 60-70% of obese persons have hyperlipidemia. The main findings of the different studies were that obesity, higher lipedema, and high blood pressure are strongly associated with cardiovascular complications [17]. Different studies showed that obesity and lipid profile has close relationships. In the previous studies a close associations of obesity, hypercholesterolemia, hypertriglyceridemia and high blood pressure, with cardiovascular medical complications in various populations were noted [18]. The first written accounts of obesity appear at the close of the 1800s and the start of the 1900s. More than 57,000 publications have been published in PubMed as of right now with the term "obesity" in the title; these numbers increase if the term is also searched for in the abstract [19]. According to unique research, the obesity incidence among adults in numerous countries in North Africa, Oceania, and the Middle East exceeded 50% in 2013. This is pretty worrying [20]. Obesity was lower but still extremely common in other regions of the world, such as North America, where one-third of adults suffer from the

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condition, and Western Europe, where one-fifth of persons do [21]. Despite the fact that coronary artery disease and stroke have similar risk factors, we found that patients with a history of thrombotic events, Transient Ischemic Attack (TIAs), or stroke were much less likely to have obstructive coronary artery disease [21,22]. Our study's utilization of a large sample size and realistic portrayal of the actual practice environment of a reputed invasive cardiology center is one of its strengths [23]. However, the study has a number of drawbacks, including a retrospective design that limits the collection of certain data (alcohol, BMI, smoking); and the impact of the angiographer's visual assessment on the assessment of stenosis severity, which could result in a larger margin of error [24].The variables of this study, which were measured for the male and female participants in Groups A and B, respectively, and which have a significant correlation with cardiovascular medical complications, include BMI, systolic and diastolic blood pressure, Troponin I, cholesterol, triglycerides, LDL, and HDL blood serum levels. The current study also has very close relationships with previous studies [25]. There were remarkably significant (p-Value < 0.05) differences observed between each group's variables. Neeland *et al.*, in 2018 found from their research that Obesity causes cardiovascular disease and death irrespective of other cardiovascular risk factors. More recent research identifies abdominal obesity, as measured by waist circumference, as a cardiovascular disease risk factor that is independent of BMI. Obesity is regarded as a heterogeneous illness in which people with comparable BMIs might have different metabolic and CVD risk profiles [26]. Thus, the risk of obesity-related cardiovascular problems is mostly determined by individual variations in regional body fat distribution, which have a deleterious impact on heart structure and function. Excess adiposity alters cardiac function both directly, through effects on the heart and vascular, and indirectly, through obesity-related comorbidities. Excess adipose tissue buildup causes hemodynamic alterations, such as increased blood volume and cardiac output and a decrease in systemic vascular resistance [17].

CONCLUSIONS

The study demonstrated significant (p-Value < 0.05) variations in blood serum levels of cholesterol, triglycerides, LDL, HDL, BMI, systolic and diastolic blood pressure, Troponin I, and cholesterol levels between male and female individuals in Groups A and B. These findings highlight the possibility of using Troponin I as a predictor of cardiovascular issues and the importance of addressing modifiable risk factors as soon as possible. Further long-term study is required to validate these associations and direct targeted preventative measures.

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Authors Contribution

Conceptualization: ZH, MNS[2]
Methodology: SUSZ
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All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

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Original Article

Association of Osteoporosis with Antibiotic Resistance among Postmenopausal Women with Open Tibial Fractures

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ABSTRACT

Osteoporosis is common among postmenopausal women and can complicate the healing of open tibial fractures. Antibiotic resistance is a growing concern in treatment. Yet, the connection between osteoporosis and antibiotic resistance remains unclear, needing the investigation for improved patient care. **Objective:** To explore the association between osteoporosis and antibiotic resistance among postmenopausal female patients with open tibial fractures. **Methods:** This cross-sectional study was conducted at Department of Orthopedic Surgery, Liaquat University of Medical and Health Sciences, Jamshoro, with sample size of 240 postmenopausal women with open tibial fractures and signs of infection within one week of the fracture. Participants were chosen via non-probability sampling method. Bacteriological samples for culture were obtained from secretions adjacent to the infected tissue. Data analysis was conducted using SPSS version 21.0. **Results:** The majority of osteoporotic patients experienced Road Traffic Accidents (RTA) (42.5%), followed by falls from height (35.3%), while firearm injuries were less common (22.2%). *Staphylococcus aureus* was the most common pathogen in both osteoporotic (40%) and non-osteoporotic (39.9%) patients, followed by *Escherichia coli, Methicillin-Resistant Staphylococcus Aureus (MRSA), Klebsiella, and Pseudomonas aeruginosa. Antibiotic resistance was predominantly found against S. aureus, MRSA, Klebsiella* and *E. coli.* Co-Trimoxazole exhibited the highest resistance rates across all four bacterial organisms, ranging from 34% to 50%. **Conclusions:** The study found varying antibiotic resistance patterns across various pathogens, with notable resistance observed MRSA strains. Antibiotic resistance was observed in osteoporotic group, with Co-Trimoxazole showing the highest resistance rates.

INTRODUCTION

Research indicates that by 2050, the global population aged 60 and above is expected to double, reaching 22% [1]. Among this group, many suffer from osteoporosis, a condition that weakens bones and increases the risk of fractures [2, 3]. Osteoporosis is characterized by fragile bones due to abnormal structure and reduced mass [4]. About 40% of people face a significant fracture risk, similar to heart disease [5]. This condition is a major public health concern, contributing to mortality rates, reduced mobility, and high healthcare costs [6]. As the population ages, the burden of osteoporosis is expected to grow [7]. The cessation of menstruation for one year or more in women is defined as menopause by the World Health Organization (WHO) [8]. Perimenopause, characterized by irregular menstruation before menopause, varies in duration. In Pakistan, the average age at menopause is 44.6 years, with ages ranging from 25 to 59 years [9]. Osteoporosis affects over 200 million women worldwide, and postmenopausal

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women are especially vulnerable to its severe consequences, such as osteoporotic fractures [10]. Research indicates that nearly one-third (33%) of women over 50 years old have a likelihood of experiencing osteoporotic fractures [11]. Estrogen levels have a positive correlation with Bone Mineral Density (BMD) and play a protective role against osteoporotic fractures [12]. This association may be explained by the direct effects of estrogen on bone cells, including osteoblasts, osteocytes, and osteoclasts, which contribute to maintaining a balance between bone formation and resorption [13]. Weakening of bones increases the risk of open fractures, particularly in the extremities. Previous research has highlighted the high contamination rates observed in open tibial fractures, which can result in delayed wound healing and treatment failure. Prompt administration of antibiotic prophylaxis following injury, along with urgent and thorough débridement, irrigation, and bony stabilization, is crucial to minimize the risk of infection and enhance outcomes [14]. Despite the established standard of care recommending timely irrigation and debridement within six hours post-injury for managing open tibial fractures, current evidence does not uniformly support this practice, and uncertainties persist regarding the ideal irrigation solution and pressure [15]. Information about which germs are usually found in hospitals and how they needs to be responded to antibiotics is important for giving patients the right treatment [14]. Doctors choose the right antibiotics and how long to use them based on factors like the kind of broken bone, how the injury happened, where it is, the results of tests to see which germs are present, and what kinds of germs are causing the infection. The primary goal of antimicrobial therapy is to safeguard clean tissue from infection and reduce the number of contaminating bacteria in damaged tissue until surgical irrigation and debridement can be performed [16]. However, there is a lack of clear evidence regarding the specific causative organisms and their sensitivity patterns in postmenopausal women with osteoporosis, necessitating further investigation.

The aim of this study was to explore the association between osteoporosis and antibiotic resistance among postmenopausal female patients with open tibial fractures, presenting at the Department of Orthopedic Surgery, Liaquat University of Medical and Health Sciences, Jamshoro.

This study was conducted to assess the empathy scores among medical and dental students and to correlate empathy scores with demographic features like age, gender and academic year.

METHODS

A cross-sectional study was conducted at Department of Orthopedic Surgery, Liaquat University of Medical and Health Sciences, Jamshoro. A sample size of 240 cases was determined with a 90% confidence interval and a 5% margin of error, taking the prevalence of osteoporosis in postmenopausal women as 33% [11]. Non-probability consecutive sampling was utilized to select postmenopausal women with and presenting with open tibial fractures and signs of infection within one week of the fracture. Osteoporosis was diagnosed via Bone Mineral Density Method (BMD). Exclusion criteria encompassed patients presenting after seven days of the fracture, those receiving antibiotics for infection before or after the accident, women having diabetes with blood sugar levels exceeding 186mg/dl, and cases of open tibial fractures categorized as Gustilo type III C. The study lasted 1 year from Feb 2017 to Jan 2018. After obtaining informed consent, demographic information, history and examination of the patients along with assessment of wound condition was done. Radiological and microbiological investigations were performed. Bacteriological samples were obtained from secretions adjacent to the infected tissue using sterile cotton swabs and disposable syringes, which were promptly transferred to the microbiology laboratory for incubation at 37°C for 24 hours to enrich bacterial cells. Gram staining and acid-fast staining were performed on all samples, followed by sub culturing for aerobics. Isolates were identified using standard microbiological procedures and tested for antimicrobial susceptibilities via the Kirby Bauer method in accordance with Institutional Laboratory guidelines. Sensitivity patterns were determined for detected causative organisms. Data analysis was conducted using SPSS version 21.0, presenting main study variables such as causative bacterial organisms and their sensitivities in terms of frequency, percentage, and stratification for effect modifiers like, type of fracture prior to arrival at Liaquat University Hospital. Chi-square test was applied to assess associations among variables.

RESULTS

The study comprised 240 female patients with open tibial fractures with a mean age of 52.98 ± 6.479 years. 153 (63.75%) women were diagnosed with osteoporosis, while 87 (36.25%) did not show any sign of osteoporosis (Figure: 1). The duration of fracture was recorded to be 10.76 ± 3.151 hours on average, while the time from injury to the collection of culture swabs was found to be 5.9 ± 1.27 hours.

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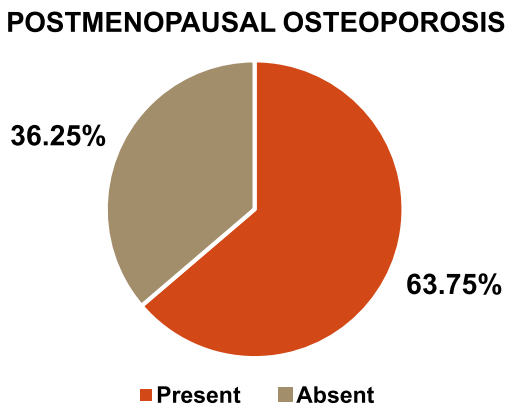

Figure 1: Postmenopausal Osteoporosis Status among Females

In table 1, regarding the mode of injury, the majority of osteoporotic patients experienced Road Traffic Accidents (RTA) (42.5%), followed by falls from height (35.3%), while firearm injuries were less common (22.2%). Conversely, non-osteoporotic patients had a higher incidence of RTA (51.7%) and falls from height (39.1%), with firearm injuries being relatively rare (9.2%). Regarding the type of fracture, osteoporotic patients predominantly presented with Type III A fractures (53.6%), whereas Type III B fractures were more prevalent among non-osteoporotic patients (70.1%). These findings suggest a potential association between osteoporosis and the severity or mechanism of injury in patients with open tibial fractures.

Table 1: Mode of Injury and Type of Fracture among Patients with Open Tibial Fractures

Variables	N (%)	
	Osteoporotic (n=153)	Non-Osteoporotic (n=87)
Mode of Injury		
RTA	65 (42.5%)	45 (51.7%)
Fall from Height	54 (35.3%)	34 (39.1%)
Firearm Injury	34 (22.2%)	8 (9.2%)
Types of Fracture		
Type III A	82 (53.6%)	26 (29.9%)
Type III B	71 (46.4%)	61 (70.1%)

In table 2, the frequency of causative bacterial organisms varied between the two groups. Staphylococcus aureus (*S. aureus*) was the most common pathogen in both osteoporotic (40%) and non-osteoporotic (39.9%) patients, followed by *Escherichia coli (E. coli), Methicillin-resistant Staphylococcus aureus (MRSA), Klebsiella,* and *Pseudomonas aeruginosa (P. aeruginosa).* Interestingly, while the overall distribution of bacterial organisms was similar between the two groups, there were slight variations in the percentages, indicating potential differences in susceptibility or exposure to specific pathogens among osteoporotic and non-osteoporotic patients.

Table 2: Frequency of Various Causative Bacterial Organisms among Patients with Open Tibial Fractures

Bacterial Organisms	Total N (%)	Osteoporotic (n=153) N (%)	Non-Osteoporotic (n=87) N (%)
Staphylococcus aureus (S. aureus)	96 (40%)	61 (39.9%)	35 (40.2%)
Escherichia coli (E. Coli)	38 (16%)	24 (15.7%)	14 (16.1%)
Methicillin-resistant Staphylococcus aureus (MRSA)	33 (14%)	21 (13.7%)	12 (13.8%)
Klebsiella	24 (10%)	15 (9.8%)	9 (10.3%)
Pseudomonas aeruginosa	19 (8%)	11 (7.2%)	8 (9.2%)
Enterococcus species	9 (4%)	4 (2.6%)	5 (5.7%)
Coagulase-negative Staphylococcus (B-Staphylococcus)	9 (4%)	4 (2.6%)	5 (5.7%)
Acinetobacter	9 (4%)	4 (2.6%)	5 (5.7%)

In table 3, the investigation into antibiotic resistance patterns revealed varying degrees of resistance across the top four causative bacterial organisms. Meronem exhibited a statistically non-significant correlation with MRSA infections (p = 0.31), indicating a higher resistance rate compared to other antibiotics in the context of MRSA. Similarly, Co-Trimoxazole displayed a significant association with MRSA (p = 0.02), suggesting heightened resistance levels against this bacterial strain when treated with Co-Trimoxazole. Additionally, Co-Trimoxazole demonstrated significance in its association with *E. Coli* infections (p = 0.03), implying a potential challenge in treating *E. Coli*-related open tibial fractures with this antibiotic. Conversely, several antibiotics showed no significant correlation with any particular bacterial strain among osteoporotic patients with open tibial fractures. For instance, Avelox, Linzulin, Ceftazidime, Gentamicin, and Ceftriazone did not exhibit statistically significant associations with any of the studied bacterial organisms, highlighting potential versatility in their effectiveness across various bacterial strains
in this patient population.

Table 3: Antibiotic Resistance with Respect to Top 4 Causative Bacterial Organisms Among Osteoporotic Patients with Open Tibial Fractures

Antibiotics	Causative Bacterial Organisms			
	S. Aureus N (%) P-value	*MRSA* N (%) P-value	*Klebsiella* N (%) P-value	*E. Coli* N (%) P-value
Meronem	42 (18%) p = 0.12	68 (28%) p = 0.31	56 (22%) p = 0.41	82 (34%) p = 0.76
Pipericillin	56 (22%) p = 0.72	82 (34%) p = 0.52	68 (28%) p = 0.32	92 (38%) p = 0.73
Avelox	28 (12%) p = 0.91	56 (22%) p = 0.1	42 (18%) p = 0.23	68 (28%) p = 0.47
Linzulin	56 (22%) p = 0.82	92 (38%) p = 0.9	82 (34%) p = 0.1	108 (44%) p = 0.83

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Ceftazidime	42 (18%) p = 0.3	68 (28%) p = 0.2	56 (22%) p = 0.72	82 (34%) p = 0.22
Gentamicin	56 (22%) p = 0.3	82 (34%) p = 0.4	68 (28%) p = 0.63	92 (38%) p = 0.53
Ceftriazone	28 (12%) p = 0.3	54 (22%) p = 0.1	42 (18%) p = 0.21	68 (28%) p = 0.67
Co-Trimoxazole	82 (34%) p = 0.12	108 (44%) p = 0.02	96 (40%) p = 0.61	122 (50%) p = 0.03
Ofloxacin	68 (28%) p = 0.53	92 (38%) p = 0.22	80 (32%) p = 0.83	104 (42%) p = 0.9

DISCUSSION

Wound infections are a concern not only for surgeons but for everyone involved in caring for orthopedic and trauma patients. They can lead to more sickness, higher healthcare expenses, and sometimes serious consequences [17]. The types of germs causing infections in surgical wounds with implants haven't changed much over the years, except for some new germs that are resistant to antibiotics [18]. An open fracture occurs when the bone breaks through the skin, exposing it to the external environment. With the increasing population, industrialization, and firearm incidents worldwide, the incidence of open fractures has been on the rise. A study published in 2018 indicated a mortality rate of 38.5% among patients with open fractures. A report published in 2016 found a mortality rate of 36% and amputation in 28 cases out of 96 open tibial fractures [19, 20]. Before 1916, during World War I, open fractures resulted in an 80% mortality rate for femur fractures, which later reduced to 15.6% with more aggressive management. Various classification systems exist for open fractures, with Gustilo's system being commonly used. In developed countries, proper management has led to low infection rates, with reported incidences of 0.2% for Type I fractures, 2-7% for Type II, and 10-25% for Type IIIB and IIIC fractures. However, the amputation rate remains high, exceeding 50% for some types [21, 22]. In a recent study involving 50 cases, the majority were Male (74%), consistent with previous findings. The most affected age group was between 20-40 years, with a Mean age of 32.98 years. Road traffic accidents were the leading cause of injury (46%), followed by falls from height (36%) and firearm injuries (18%). This differs from other studies due to variations in lifestyle and geographical location. Type IIIB fractures were the most common (48%) in the study, followed by Type IIIA (34%), Type II (14%), and Type I (4%). These findings align with previous research, albeit with slight variations due to facility differences [23]. Infections associated with combat-related tibial fractures typically involve Gram-negative organisms, with *Staphylococcus aureus* being the most common microorganism isolated. However, the relative rates may vary across different centers. In terms of antibiotic sensitivity, certain drugs such as Meronem, Pipericillin, and Avelox were found to be highly effective against *Staphylococcus aureus* and other organisms. [24]. The investigation into antibiotic resistance patterns among *Staphylococcus aureus*, *MRSA*, *Klebsiella*, and *Escherichia coli* in orthopedic wound infections revealed significant resistance rates across various antibiotics. Our study's resistance rates for Staphylococcus aureus and *MRSA* align with trends reported elsewhere, reflecting the widespread challenge of combating these resistant strains. Variations in prevalence may occur due to differences in geographic regions and healthcare practices as explained by de Haan *et al.*, in 2015 [25]. In accordance with prior investigations, our findings demonstrate significant resistance patterns among *Klebsiella* strains [26]. This emphasizes the necessity for rigorous surveillance and infection control measures to mitigate the spread of antibiotic resistance in healthcare settings. The heightened rates of resistance observed in *Escherichia coli* echo concerns raised in similar study by *Lee et al.*, in 2015, necessitating tailored therapeutic approaches and sustained efforts to preserve antibiotic efficacy globally [27]. The widespread resistance to Co-Trimoxazole across various bacterial organisms underscores its limited clinical utility in managing orthopedic infections as described by Dombrovskiy *et al.*, in 2017 [28]. Clinicians are advised to consider local resistance profiles when selecting alternative antimicrobial agents to optimize patient outcomes [29].

CONCLUSIONS

The study found that among postmenopausal women open tibial fractures have a high prevalence of osteoporosis i.e., 63.75%. S. aureus was found to be most common pathogen present in both groups. Antibiotic resistance patterns vary across these pathogens, with notable resistance observed particularly in MRSA strains. Antibiotic resistance was observed in osteoporotic group, with Co-Trimoxazole showing the statistical significant highest resistance rates.

Authors Contribution

Conceptualization: RAB
Methodology: RAB, LDM, AA, MFJ, AGA
Formal analysis: RAB, LDM, MFJ, AGA
Formal analysis: RAB, LDM
Writing, review and editing: RAB, LDM, AA, MFJ, AGA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

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Original Article

Comparison of the Postoperative Pain Following Endodontic Irrigation Using 1.3% Versus 5.25% Sodium Hypochlorite in Mandibular Molars with Necrotic Pulps

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ABSTRACT

Endodontic irrigation plays a crucial role in root canal treatment, aiming to disinfect the root canal system be removing debris, bacteria and tissue remnants. **Objective:** To compare the postoperative pain between two concentrations (1.3% and 5.25%) of irrigation using sodium hypochlorite (NaOCl) in lower molars with necrotic pulps. **Methods:** Sixty patients with nonvital pulps in mandibular molars, either gender, mature teeth with a closed apex or age between 18 and 60 years were included. Patients were assessed for postoperative pain in each group at 24 hours. The Chi-square test and student t-test were used to compare the postoperative pain outcome of both groups. **Results:** The mean age of the patients in group A was 33.76 ± 4.06 years, and in group B was 32.10 ± 5.84 years. Pre-operative pain was statistically insignificant in both groups (p = 0.123), with an average VAS of 3.16 ± 0.64 in group A and 3.40 ± 0.49 in group B. The average pain was significantly lower at 1.33 ± 0.47 in the 1.3% sodium hypochlorite group compared to 1.63 ± 0.66 in the 5.25% NaOCl group (p = 0.051) after 24 hours. The average post-operative pain score was significantly higher in females compared to males in the 1.3% NaOCl group (p = 0.033). However, the average post-operative pain score was statistically insignificant between males and females in the 5.25% NaOCl group (p = 0.445). **Conclusion:** Endodontic irrigation using 1.3% NaOCl was found to be more effective in reducing post-operative pain compared to endodontic irrigation using 5.25% NaOCl.

INTRODUCTION

In dentistry, pain assumes a pivotal role, often standing as the foremost trigger for dental anxiety [1, 2]. It is defined as a disagreeable sensory and emotional sensation associated with real or potential tissue injury, involving complex pathways such as inflammatory reactions at the affected site and the transmission of action potentials to the central neerceived by patients as one of the most agonizing dental procedures, fueling significant apprehension about postoperative pain [5, 6]. Comprehending postoperative pain following root canal treatment and its determining factors is essential for clinicians to proficiently address pain [7, 8]. This understanding not only aids in minimizing the necessity for tooth extraction but also assists general practitioners in applying evidence-based protocols for managing postoperative pain following non-surgical root canal treatment [9]. Despite the enduring pain relief achieved through root canal treatment, patients frequently encounter postoperative pain shortly after the procedure [10]. Post-endodontic pain, which refers to pain

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experienced after root canal treatment, can stem from various factors throughout the treatment process. These factors encompass pre-treatment considerations, such as the initial condition of the tooth and surrounding tissues, as well as intra-treatment variables, including the number of visits required for treatment completion and the specific techniques employed during the procedure [11, 12]. Additionally, post-treatment factors, such as the type of irrigant and intracanal medication utilized, along with the method of root canal instrumentation and filling, can also influence the likelihood and severity of post-endodontic pain [13]. One of the commonly used agents in endodontic procedures is sodium hypochlorite (NaOCl), renowned for its efficacy in dissolving organic matter and its potent antimicrobial properties. Despite its widespread use over seven decades, it is crucial to note that NaOCl, particularly at higher concentrations, has the potential to irritate the surrounding tissues, leading to periradicular tissue irritation [14]. Complications arising from the extrusion of sodium hypochlorite during endodontic procedures have been linked to increased pain levels, especially in cases involving necrotic teeth. Therefore, while NaOCl remains a valuable tool in endodontic practice, careful attention to its concentration and proper application techniques is imperative to mitigate the risk of associated pain and complications [15]. The investigation contrasts postoperative discomfort after 24 hours following endodontic rinsing utilizing 1.3% versus 5.25% sodium hypochlorite in mandibular molars with necrotic pulps, aiming to address a local gap in information. Root canal-associated pain is a major concern for patients and dentists, with no agreed-upon pain control method. This study aims to identify the most effective treatment for postoperative endodontic pain by comparing both groups simultaneously. The study was aimed to compare the post-endodontic pain scores between 1.3% and 5.25% NaOCl irrigants in necrotic lower permanent molars.

METHODS

This comparative cross sectional study was conducted at the Department of Dentistry, Liaquat University of Medical and Health Sciences, Jamshoro/Hyderabad, from January 2022 to October 2023, involving 60 patients selected through non-probability consecutive sampling technique. The sample size was determined using the WHO method, which considered a population size of 1,000,000, an estimated percentage frequency of the outcome factor in the population (p)of 0.3%, and a 95% confidence level with a margin of error (d) of 5%. A design effect of 1 was accounted for. Initially, the calculated sample size was 25. However, to bolster the study's statistical power, an additional 15 samples were included, resulting in a total sample size of 60. The inclusion criteria for the study were mandibular molars with nonvital pulps, individuals of either gender, mature teeth with a closed apex, and ages ranging from 18 to 60 years. Conversely, exclusion criteria comprised non-consenting individuals, patients with a history of allergy to any medications, retreatment cases, and patients who were taking medications for pain. Additionally, individuals with a history of respiratory, cardiovascular, or neurological disorders, as well as primary teeth, were excluded from the study. The study was carried out after obtaining ethical approval from the hospital concerned. Patients undergoing root canal treatment at the dental Department, LUMHS, who met the inclusion criteria, were recruited. During patient's initial c appointment, the study's aim, along with its potential risks and benefits, was thoroughly explained, and informed consent was obtained. Additionally, a brief demographic history was collected from each patient. Subsequently, patients were randomly assigned to either group A (undergoing endodontic irrigation with 1.3% sodium hypochlorite) or group B (undergoing endodontic irrigation with 5.25% sodium hypochlorite) using sealed opaque envelopes. Root canal treatments were performed across two sessions. During the initial session, each tooth received anesthesia using 1.8 ml of 2% lignocaine hydrochloride (Medicaine inj 1:100,000, Huons Co., LTD) administered via the inferior alveolar nerve block technique. Following access preparation, rubber dam isolation was applied to each tooth. Subsequently, the pulp chamber was filled with 3 mL of irrigant. Canal patency was then established, and an initial glide path was created using #10 and #15 K-files (Mani K-files). After canal preparation, the working length was established utilizing an apex locator (Woodpecker Woodpex III) and confirmed radiographically to be 0.5mm occlusally to radiographic apex. The root canal was prepared using a NiTi rotary system (M3-Pro Gold) and a torque-controlled endodontic motor (Tangshan Umg Medical Instrument Co., Ltd), adhering to the manufacturer's guidelines. Canal shaping commenced with the Sx instrument, shaping the coronal two-thirds initially, followed by shaping the apical third with instruments S1, S2, F1, F2, or F3. Before each instrument change, apical patency was ensured with a size 10 K-file. Syringe irrigation with 3 mL of irrigant occurred between instruments, maintaining needle penetration 3mm shorter than the canal's working length. Once preparation reached the master apical instrument, adjusted by a rubber stopper, a final flush with 5 mL of saline was executed. Paper points were utilized to dry the canals, and a dry cotton pellet was placed in the pulp chamber, restored with temporary restorative material (Cavit). During the second visit, following the removal of temporary filling and placement of a rubber dam, the root canals underwent irrigation with the same solution used during the initial visit. Subsequently,

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the canals were re-prepared using identical instrument sizes as in the first visit. For canal filling, a modified single cone technique was employed, utilizing Gutta purcha cones matched in size (ProTaper Universal E-Dental Mart) and a non-eugenol calcium hydroxide polymeric root canal sealer (Sealapex Kerr Endodontics). This was followed by temporary cavity filling. Patients were then assessed for postoperative pain at 24 hours. Preoperative pain was assessed using a Visual Analog Scale (VAS) ranging from 0 (no pain) to 10 (unbearable pain). The collected data, encompassing both quantitative and qualitative variables, were recorded in the Performa. SPSS version 20.0 was utilized for the statistical analysis. Mean and standard deviation (SD) were computed for quantitative variables such as age and VAS pain scores in both groups. For qualitative variables like gender and severity of pain, frequency and percentage calculations were performed. Normality was confirmed using the Shapiro-Wilk test, thus allowing for the application of parametric tests. The independent t-test was employed to compare the score of postoperative pain between both groups. Effect modifiers were managed through stratification of age, gender, and duration of root canal treatment to assess their impact on the outcome variables. Post-stratification Chi-square test and independent t-test were conducted, with a significance level set at $p \leq 0.05$.

RESULTS

Table 1 shows distribution of gender and age characteristics within both endodontic irrigation groups. Regarding gender distribution, in the 1.3% NaOCl group, 7 participants (23.3%) were male, whereas in the 5.25% NaOCl group, 12 participants (40.0%) were male. The gender distribution was not different statistically (p=0.165) between the two groups. Conversely, in terms of age, the mean ± standard deviation (SD) in the 1.3% NaOCl group was 33.76 ± 4.06 years, while in the 5.25% NaOCl group, it was 32.10 ± 5.84 years. The difference in age between the two groups was also not statistically significant (p=0.35).

Table 1: Distribution of Gender and Age in Both Groups

Variable	Characteristics	Endodontic Irrigation Group		p-Value
		1.3% NaOCl (n=30)	5.25% NaOCl (n=30)	
Gender N (%)	Male	7 (23.31%)	12 (40.0%)	0.165*
	Female	23 (76.71%)	18 (60.0%)	
Age (Years)	Mean ± SD	33.76 ± 4.06	32.10 ± 5.84	0.35**

**Student t Test, *Chi-Square Test

Table 2 shows the comparison of pre- and post-operative pain scores between the two endodontic irrigation groups comprising a total of 60 participants. For pre-operative pain scores, the mean Visual Analog Scale (VAS) score for the 1.3% NaOCl group was 3.16 ± 0.64, while for the 5.25% NaOCl group, it was 3.40 ± 0.49. The difference in pre-operative pain scores was not statistically significant (p=0.123) between the two groups. However, for post-operative pain scores, the mean VAS score for the 1.3% NaOCl group was 1.33 ± 0.47, significantly lower than the 1.63 ± 0.66 observed in the 5.25% NaOCl group (p=0.036).

Table 2: Comparison of Pre and Post-Operative Pain Score between Irrigation Groups (n=60)

Time	Endodontic Irrigation Group	n	Pain (VAS) Score	p-Value*
Pre-Operative	1.3% NaOCl	30	3.16 ± 0.64	0.123
	5.25% NaOCl	30	3.40 ± 0.49	
Post-Operative	1.3% NaOCl	30	1.33 ± 0.47	0.036
	5.25% NaOCl	30	1.63 ± 0.66	

*Independent test

Table 3 shows the comparison of Post-Operative Pain (VAS) scores between types of irrigation, stratified by age group. For participants aged 18-35 years, the mean post-operative pain score was significantly lower in the 1.3% NaOCl group (1.15 ± 0.37) compared to the 5.25% NaOCl group (2.00 ± 0.65), with a p-value less than 0.001. However, for participants aged 36-60 years, while the mean post-operative pain score was lower in the 1.3% NaOCl group (1.63 ± 0.50) compared to the 5.25% NaOCl group (1.26 ± 0.45), this difference was not statistically significant (p=0.091).

Table 3: Comparison of Post- Operative Pain (VAS) Score between Types of Irrigation Stratified by Age Group

Age Group	Endodontic Irrigation Group	n	Post-Operative Pain (VAS) Score	p-Value*
18-35 years	1.3% NaOCl	19	1.15 ± 0.37	<0.001
	5.25% NaOCl	11	2.00 ± 0.65	
36-60 years	1.3% NaOCl	15	1.63 ± 0.50	0.091
	5.25% NaOCl	15	1.26 ± 0.45	

*Independent t test

Table 4 presents the comparison of Post-Operative Pain (VAS) scores between types of irrigation, stratified by gender. For male participants, the mean post-operative pain score was significantly lower in the 1.3% NaOCl group (1.00 ± 0.01) compared to the 5.25% NaOCl group (1.75 ± 0.45), with a p-value less than 0.001. However, for female participants, while the mean post-operative pain score was slightly higher in the 1.3% NaOCl group (1.43 ± 0.50) compared to the 5.25% NaOCl group (1.55 ± 0.78), this difference was not statistically significant (p=0.62).

Table 4: Comparison of Post- Operative Pain (VAS) Score between Types of Irrigation Stratified by Genders

Gender	Endodontic Irrigation Group	n	Post-Operative Pain (VAS) Score	p-Value*
Male	1.3% NaOCl	7	1.00 ± 0.01	<0.001
	5.25% NaOCl	12	1.75 ± 0.45	
Female	1.3% NaOCl	23	1.43 ± 0.50	0.62
	5.25% NaOCl	18	1.55 ± 0.78	

*Independent t test

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DISCUSSION

The observation of frequent postoperative pain after root canal treatment can be attributed to a combination of mechanical manipulation, chemical irritation, and residual bacterial infection, particularly in teeth with nonvital pulps. Addressing these factors through careful technique, appropriate medication, and thorough disinfection can help minimize postoperative discomfort and improve patient outcomes following root canal treatment [16]. It is deemed essential by clinicians to focus on effective pain management during both endodontic procedures and the post-operative period. Our study's average age in group A was 33.76 ± 4.06 years and in group B was 32.10 ± 5.84 years with a statistically insignificant difference (p = 0.352). Regarding gender distribution, in group A, 23.3% were males and 76.7% were females, whereas in group B, 40.0% were males and 60.0% were females. Nonetheless, these gender differences were also statistically non-significant (p = 0.165). The observations made in this study parallel those reported by Mostafa *et al.*, in their research, out of 308 patients, 178 were females and 130 were males, spanning an age range of 25 to 45 years, with an average age of 31.88 ± 5.821 years [17]. This study sought to evaluate and compare the levels of post-endodontic pain using two different concentrations of NaOCl, specifically 1.3% and 5.25%, in necrotic lower molars. Results showed a significantly lower average Post-Endodontic Pain (VAS) score of 1.33 ± 0.47 in the 1.3% NaOCl group compared to 1.63 ± 0.66 in the 5.25% NaOCl group, with a p-value of 0.036. These findings suggest that using 1.3% NaOCl for irrigation during root canal treatment may offer superior post-operative pain management compared to using 5.25% NaOCl. A study by Mostafa *et al.*, was conducted in Egypt, involving 308 patients, each presenting with both asymptomatic and symptomatic molars [17]. They were randomly assigned into two equal groups, utilizing the permuted-block method, based on NaOCl concentration: 1.3% or 5.25% (n = 154). The study findings suggested that the utilization of 1.3% NaOCl resulted in diminished intensity and frequency of post-endodontic pain when compared to 5.25% NaOCl in mandibular molars with nonvital pulps treated through a two-visit root canal approach. The study by Farzaneh S *et al.*, in Iran, involving 122 patients with irreversible pulpitis in mandibular molars, compared the effects of 2.5% and 5.25% NaOCl during root canal treatment [18]. Results showed significantly lower post-endodontic pain in patients treated with 5.25% NaOCl during the first 72 hours (P = 0.021). Additionally, these patients required fewer analgesics (P = 0.001). This suggests that using 5.25% NaOCl may reduce early post-endodontic pain in one-visit root canal treatment for mandibular molars with irreversible pulpitis. In this study, there was a significant difference in the average Post-Endodontic Pain (VAS) scores between the 18-35 years age group (p < 0.001) for the two irrigation groups, whereas no significant difference was observed in the 36-60 years age group (p = 0.091). However, it's worth noting that several previous studies have reported no association between age and postoperative pain [18, 19]. Our results showed that in males, 5.25% NaOCl was more effective than 1.3%, indicating sexual dimorphism for our outcome variable. Notably, within each group, females consistently reported higher mean post-endodontic pain levels than males. These findings echo previous research, which has presented conflicting evidence regarding the impact of gender on postoperative pain. Some studies, such as that conducted by Mostafa *et al.*, suggest that females are more prone to experiencing heightened pain levels [17]. However, contrary to this, Middha *et al.*, found no correlation between gender and post-endodontic pain following endodontic treatment. Acknowledging the limitations inherent in our study, such as its small sample size and single-c enter design, it is important to note that our study exclusively enrolled patients with non-vital pulps [20]. Expanding the scope to include a more diverse patient population could enhance the generalizability of our findings. Thus, we recommend future large-scale studies to thoroughly investigate the effects of various irritant concentrations on both short- and long-term outcomes.

CONCLUSIONS

Based on our findings, it can be concluded that endodontic irrigation with 1.3% NaOCl was more effective in reducing post-operative pain compared to irrigation with 5.25% NaOCl.

Authors Contribution

Conceptualization: MM
Methodology: MM, ER, SP
Formal analysis: MM
Writing, review and editing: PM, AMNQ, AGS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Pattern of Occurrence and Severity of Oral Submucous Fibrosis Among Habitual Gutkha, Areca Nut and Pan Chewers

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ABSTRACT

Oral submucous fibrosis (OSF) is a complex, insidious and precancerous disease of the oral cavity. The high use of addictive substances in our local setting merits to be worked on finding out the resultant prevalence of OSF. **Objective:** To determine the frequency of occurrence and severity of OSF among habitual gutkha, areca nut and pan chewers. **Methods:** A total of 183 patients with presenting complaints of burning in mouth, difficulty in chewing and cheek biting and who are habitual chewer of areca nut, gutkha or pan for over 6 months with minimum frequency of 1 pack per day were recruited in this study at Oral and Maxillofacial Surgery Department of Liaquat University of Medical and Health Sciences Jamshoro, Pakistan. Severity of OSF was assessed as per clinical staging and findings was reported. **Results:** The average age of the patients was 34.57±9.98 years. Frequency of occurrence of OSF among habitual gutkha, areca nut and pan chewers was 100%. Regarding severity of OSF among habitual gutkha, areca nut and pan chewers was observed and found 31.15% stage 1, 51.91% stage 2 and 16.94% stage 3. Severity of stages were not statistically significant in all type of addiction. **Conclusions:** It was concluded that dose-dependent association between the frequency and length of daily use of commercially accessible areca nut and tobacco products and the increased risk of disease.

INTRODUCTION

Oral submucous fibrosis (OSF) is a complex, debilitating insidious and precancerous disease of the oral cavity [1]. The disease was most prevalent south-east Asia with highest incidence reported from India, Bangladesh, Sri Lanka, Pakistan and Nepal. Recent research suggests that the disease is on further rise in the region with prevalence increasing from 0.03% to 6.42% in just a few decades in the Indian subcontinent [2]. The fact that the condition is capable of undergoing malignant transformation up to 30% of the cases, makes this rise in prevalence even more worrying [3]. The morphology and physiology of the oral cavity are significantly altered by OSF, which is linked to a juxta-epithelial inflammatory reaction, fibro-elastic changes in the lamina propria layer, and epithelial atrophy, which causes the oral mucosa to become inflexible and eventually resulting in trismus and difficulty opening the mouth [4, 5]. Although OSF may appear at any age, it is more often observed in young and adults between the age of 25 and 35 years. The buccal mucosa, labial mucosa, retro-molar pads, soft palate, and floor of the mouth are the primary areas implicated. There have also been isolated reports of fibrotic alterations in the throat, oesophagus, and paratubal muscles of the Eustachian tubes [6, 7]. The first symptoms of OSF include

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inflammation, which is followed by hypovascularity, fibrosis, and blanching of the oral mucosa, which has a marble-like effect. A fibrous band also develops, causing trismus, dysphagia, dysphonia, and abnormalities in hearing and gustatory perception [8-10]. Multiple risk factors have been advocated to bear causative role in etiology of OSF, including chilies consumption, malnutrition, genetic predisposition, altered salivary composition, autoimmunity, collagen defects and areca nut chewing. Use of Areca nut, a habit in our region was believed to be the most significant risk factor contributing to OSF development [11]. Additionally, it is also believed that the amount, frequency and duration of areca nut in betel quid chewing maybe related to the development of OSF [12]. However, relying on a variety of circumstances including individual susceptibility, the kind of areca nut chewed, length of time and other variables. The time between the start of the chewing habit and the emergence of clinical signs of OSF may vary greatly, ranging from a few months to many decades [13]. Betel quid is essentially made up of areca nut, catechu, slaked lime, and betel leaf wrapped in tobacco [14]. Pan translates to "leaf" in a number of South Asian languages. The betel leaf is used to wrap a variety of items like Tobacco, spices, and areca nut wrapped in betel quid are the usual ingredients of pan. Gutkha is a tobacco and areca nut powder that is sold in premade pouches of 5 to 10 grams [15]. The usage of gutkha has suddenly increased lately because of its affordability, ease of availability, eye-catching, colored packaging, and extended shelf life [16]. Research has shown that areca nut reduces appetite, improves digestion, changes focus and relaxation, and sometimes even raises attentiveness. In a recent study patient with habit of chewing areca nut and gutkha were 58.58% [2]. Others report the percent frequencies of chewing habits of OSF patients to comprise of guthka (30%) chaliya (6.5%), raw tobacco (21.2%), manpuri (20%), pan (12.9%) and naswar (9%) [17]. Research on school going children has revealed that 40.8% children chewed areca nut regularly, 39% occasionally and 20.2% rarely [18].

This study was conducted to determine frequency of occurrence and severity of oral sub mucous fibrosis among habitual gutkha, areca nut and pan chewers, which will be beneficial for our local population in order to change their behaviors regarding personal habits. This study will also help in generating baseline data and planning strategies to control disease burden.

METHODS

A cross sectional study was conducted from February 2021 to January 2022, in Oral Maxillofacial Surgery Department of Dentistry at Liaquat University of Medical Health Sciences Hospital, Jamshoro, Pakistan. The study was based on using non-probability consecutive sampling. Total sample size calculated was 183 with margin of error set as 2.5%. Sample was calculated using Open-Epi sample size calculator. Frequency of OSF was expected as 3.06% [19]. Patients with either gender having age range of 18 to 50 years presenting with presenting complaints of burning in mouth, difficulty in chewing and cheek biting and who were habitual chewer of areca nut, gutkha and pan for over 6 months with minimum frequency of 1 pack / 1 unit per day were included in the research. Patients with limited mouth opening due to causes other than OSF, history of tobacco smoking, mentally retarded and those who were having collagen defects and autoimmune disorders were excluded from study. This study was approved by Research Ethics Committee LUMHS (LUMHS/REC/22 Dated 25.1.2021). Every research individual had their OSF status checked. A medical history was taken from OSF patients, including the kind, frequency, and length of their chewing habit. A self-assessment descriptive rating scale (Absent, Mild, Moderate, and Severe) was used to evaluate the degree of burning sensation. Salivary change that was subjective was noted. The patient was questioned about if they need repeated sips of water to moisten their mouths, swallow meals, or deal with any accumulation of saliva in their mouths. According to the patient's reaction, a rise or fall in salivation was noted on the research proforma. Using a sweet and salt solution, changes in taste sensations were evaluated. Following mouth washing, the patient was given 2 ml of either a salty solution (1% sodium chloride), sucrose solution (0.25% saccharine solution), or water, which they were to swill for one minute before spitting it out. If both answers were accurately detected, the patient's gustation was deemed normal. If the participant could not identify any of them, then the gustatory experience was deemed to be reduced. The conductive hearing loss was evaluated using the tuning fork test. The soft palate, buccal mucosa, retromolar regions, and labial mucosa were palpated for the presence of fibrous bands during a clinical examination. To termed a fibrous band, a felt structure that was thick, vertical, and continuous was regarded to be a band. Using a Vernier calliper, the interincisal distance between the maxillary and mandibular right and left central incisors was determined. According to clinical staging (Stage 1: Faucial Bands Only, Stage 2: Faucial and Buccal Bands, Stage 3: Faucial and Labial Bands), the severity of OSF was evaluated. By coding the data, the privacy and confidentiality of each patient were protected. Data were analyzed using Microsoft Excel 2016 and SPSS version 21.0. Qualitative data (gender, presenting complaint, socioeconomic status, pattern of OSF, location of fibrous band, chewing habit and stage of OSF) was expressed as number and percentage. Frequency and severity of OSF was compared with the type of habit and duration of habit

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by applying Chi-Square test. Quantitative data (age, duration and frequency of chewing areca nut, gutkha or pan) was expressed as mean & standard deviation (X ± SD). Independent T Test was used to find the significance of association among quantitative variables.

RESULTS

A total of 183 patients with presenting complaints of burning in mouth, difficulty in chewing and cheek biting. who are habitual chewer of areca nut, gutkha or pan for over 6 months with minimum frequency of 1 pack / 1 unit per day were recruited in this study. The average age of the patients was 34.57±9.98 years. Median frequency of chewing and duration of addition was 1 (IQR=1) and 9 (IQR=6) as shown in (table 1)

Table 1: Descriptive Statistics of Characteristic of Patients

Variables	Mean ± SD	Median	Interquartile Range
Age (Years)	34.57 ± 9.98	35	19
Frequency of Chewing	1.52 ± 0.572	1.00	1
Duration of Habit	10.23 ± 3.21	9	6

There were 133 (72.68%) male and 50 (27.32%) female patients encountered with OSF in this study (figure 1).

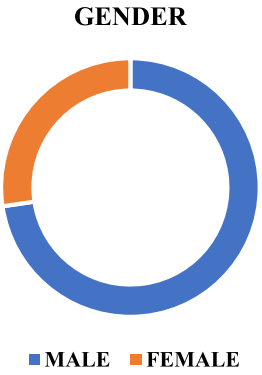

Figure 1: Gender Distribution of the Patients (n=183)

Burning sensation was observed in all patients, salvation, taste perception and hearing were also observed in 40% to 50% cases (table 2)

Table 2: Clinical Examination of the Patients

Clinical Examination		Count %
Burning Sensation	Absent	0 (0%)
	Mild	73 (39.9%)
	Moderate	102 (55.7%)
	Severe	8 (4.4%)
Salivation	Normal	76 (41.5%)
	Increased	101 (55.2%)
	Decreased	6 (3.3%)
Taste Perception	Normal	104 (56.8%)
	Altered	79 (43.2%)
Hearing	Normal	99 (54.1%)
	Altered	84 (45.9%)

Regarding type of habit 81 (44.3%) were observed with habit of chewing areca nut 85 (46.4%) were chewing pan and 47 (25.7%) were habitual of gutkha. Some of the patients were also taking pan and areca and also gutkha. Type of habit, frequency of chewing habit per pack/unit per day Clinical examination, location of fibrous bands, functional and clinical staging are recorded. Regarding severity of OSF among habitual gutkha, areca nut and pan chewers was observed and found 31.15% stage 1, 51.91% stage 2 and 16.94% stage 3 (table 3)

Table 3: Frequency Distribution of Different Variables

Frequency Variables		Count %
Type of Habit	Areca nut	81 (44.3%)
	Pan	85 (46.4%)
	Gutkha	47 (25.7%)
Frequency of Chewing	1 Pack per day	95 (51.91%)
	2-3 Pack per day	81 (44.26%)
	3-5 Pack per day	07 (3.83%)
Fibrous Band Location	Buccal Mucosa	123 (67.21%)
	Labial Mucosa	24 (13.11%)
	Retromolar Area	20 (10.93%)
	Fauces Area	14 (7.65%)
	Soft Plate	02 (1.09%)
Functional Staging	Stage A	76 (41.53%)
	Stage B	83 (45.36%)
	Stage C	24 (13.11%)
Clinical Staging	Stage 1	57 (31.15%)
	Stage 2	95 (51.91%)
	Stage 3	31 (16.94%)

Stratification analysis was performed and observed that severity of OSF was associated with age groups, gender but not statistically significant with occupation, socioeconomic status, frequency of chewing and duration of addition as shown in table 4.

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Table 4: Frequency of Severity of OSF Among Habitual Guthka, Areca Nut and Pan Chewers Stratified by Effect Modifiers

Effect Modifiers		Severity of OSF			Total	p-Value
		Stage 1 (n=57)	Stage 2 (n=95)	Stage 3 (n=31)		
		Count %	Count %	Count %		
Age (Years)	<30	34 (45.3%)	34 (45.3%)	7 (9.3%)	75	0.007
	31 to 40	10 (20.0%)	30 (60.0%)	10 (20.0%)	50	
	>40	13 (22.4%)	31 (53.4%)	14 (24.1%)	58	
Gender	Male	34 (25.6%)	79 (59.4%)	20 (15.0%)	133	0.004
	Female	23 (46.0%)	16 (32.0%)	11 (22.0%)	50	
Occupations	Worker	34 (27.2%)	73 (58.4%)	18 (14.4%)	125	0.036
	Not Working	23 (39.7%)	22 (37.9%)	13 (22.4%)	58	
Socioeconomic Status	Low	35 (29.4%)	66 (55.5%)	18 (15.1%)	119	0.280
	Medium	15 (30.0%)	23 (46.0%)	12 (24.0%)	50	
	High	7 (50.0%)	6 (42.9%)	1 (7.1%)	14	
Frequency of Chewing	1 Pack/Unit per Day	33 (34.7%)	42 (44.2%)	20 (21.1%)	95	0.084
	2-3 Packs per Day	24 (29.6%)	48 (59.3%)	9 (11.1%)	81	
	3-5 Pack/Unit per Day	0 (0%)	5 (71.4%)	2 (28.6%)	7	
	5-10 Pack/Unit per Day	0 (0%)	0 (0%)	0 (0%)	0	
Duration of Habit	<12 Months	44 (32.1%)	71 (51.8%)	22 (16.1%)	137	0.813
	>12 Months	13 (28.3%)	24 (52.2%)	9 (19.6%)	46	

DISCUSSION

Oral submucous fibrosis (OSF) is a chronic oral cavity disorder that has the potential to progress to malignancy and often results in mouth cancer [19, 20]. According to our analysis, the majority of OSMF patients, with an average age ranging from 34.57±9.98 years. This is consistent with research done in Taiwan which found that the participants ages ranged from 20 to 39 years; however, research done on 1000 patients in Central India found that the participants' ages ranged from 30 to 39 years. Similarly, the age group most often afflicted was found to be between 20 and 39 years old in research conducted in Pakistan [21-23]. The primary cause of the OSF conditions is the overindulgence in tobacco substances and areca nut based goods like gutkha, pan masala, khaini, mava, etc. These very addictive items, which have been around for a few decades, come in little, inexpensive, colorful sachets that serve as betel quid replacements. Intense marketing and advertising, which often portray them as safe items, cause high consumption across all age categories, especially in India and among the migrant populations who migrate there from other countries [24]. The frequency of OSMF was much greater in males than in women [25]. In India, Sinor *et al.* discovered a male preponderance in cases of OSF [26]. The male preponderance in this research may be explained by the fact that men have easier access to areca nut and its products, which they employ more often than women. Patients who were male had a higher prevalence of OSF (73%), comparing to 2.33% in female patients. Males (69%) had a higher percentage of OSF patients than females (31%) according to another research done in Karachi [27]. In comparison, 12.8% of men and 7.5% of women were found in Indian research [28]. In Allahabad, North India, Mehrotra *et al.* studied the incidence rates of oral mucosal lesions in this hospital between 1990 to 2001. Data on age, sex, the site of involvement, and the histopathology results were gathered annually. It demonstrated the prevalence of both malignant and possibly malignant oral lesions among the patients coming to the hospital from this area [29]. Likewise, patients who used pan masala were shown to be at increased risk of acquiring OSF in a population-based case control study conducted in rural and urban Lucknow [30]. In our research on addiction types, we found that 44.3% of participants chewed areca nut habitually, 46.4% chewed pan habitually, and 25.7% habitually chewed gutkha. According to the research conducted by Srivastava et al [31]. Out of the total participants, 55.81% were habitual gutkha consumers, 6.98% were betel quid and gutkha drinkers, 26.74% were tobacco and gutkha consumers, and 10.46%) were smokers and gutkha consumers. When areca nut and pan chewers were monitored, the severity of OSF was determined to be 31.15% stage 1, 51.91% stage 2, and 16.94% stage 3. In his analysis of 1,006 OSF patients, Kumar discovered that 422 (41.94%) of the cases were stage 2 [32]. In contrast to the current research, 226 individuals (22.29%) were in stage 4, 184 individuals (18.29%) were in stage 3, and 174 individuals (17.29%) were in stage 1. This may be due to the fact that in the early stages, notable changes specifically, restricted mouth opening are not observed. Additionally, patients may not seek medical attention unless there is a severe impairment of their bodily functions. Lack of knowledge about the illness may also play a role in this. Babu *et al.*,

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research among OSF patients in Hyderabad revealed that gutkha was the most addictive substance compared to other tobacco and areca nut related goods including pan, pan masala, and raw areca nut. They discovered a clear link between chewing gutkha and OSF and concluded that eating gutkha caused OSF [33]. The incidence and severity of OSF among Moradabad, India's habitual gutkha, areca nut, and pan chewers were ascertained by Nigam et al [34]. The research found that among OSF patients, gutkha chewing was the most frequent abusive practice, with a 6.3% incidence of OSF. According to research conducted in India by Ara *et al.*, the frequency of gutkha intake was 35.3% for stage 1 OSF patients and 53.3% for stage 2 patients [24]. In another research carried out in India, Ahmad *et al.*, discovered that gutkha was primarily utilized by almost 55% of OSF patients [35]. According to Babu *et al.*, gutkha was ingested by OSF patients in greater quantities than any other similar areca nut substance. In contrast to raw areca nut, they found a robust correlation between chewing gutkha and OSF and highlighted the significant role gutkha plays in the early stages of OSF illness [33]. Shah and Sharma conducted similar research in Delhi and found that chewing gutkha generated OSF early than raw areca nut and other items [36].

CONCLUSIONS

One significant risk factor for the development of oral carcinogenesis is oral submucous fibrosis. The current investigation found a dose-dependent association between the frequency and duration of daily use of commercially available areca nut and tobacco products and the relative risk of illness. To prevent cancer, we must take action to outlaw all of these harmful items from our marketplace and establish addiction treatment centers that provide recommendations on how to use these harmless-seeming drugs. By eliminating oral pre-malignant conditions like OSF, these actions may significantly lower the risk of oral cancer.

Authors Contribution

Conceptualization: TAK, FI
Methodology: TAK, KAC
Formal analysis: BA
Writing-review and editing: FH, KA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Evaluation of Antibiotics by Disk Diffusion and Minimum Inhibitory Concentration Breakpoints in Urinary Tract Infections

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ABSTRACT

Antibiotic resistance (ABR) has made it more challenging to treat uropathogenic organisms. It is impossible to compromise antimicrobial susceptibility testing (AST), which is essential and has a significant impact on infection treatment strategies. Although labor-intensive and technically challenging for everyday laboratory use, the agar dilution technique is appropriate for monitoring and assessing novel antimicrobials. **Objective:** To determine the minimum inhibitory concentration (MIC), Agar dilution technique and disk diffusion as susceptibility test methodologies. **Methods:** This study was carried out at Khyber Girls Medical College (KGMC) Peshawar. Keeping in view the Clinical and Laboratory Standards Institute (CLSI) guidelines AST was executed. BIOMÉRIEUX® API® kits and gram staining were utilized for identification of bacteria. The disk diffusion was performed using Thermo Scientific™ Oxoid™ antibiotic discs of Co-trimoxazole, Levofloxacin, Nitrofurantoin and Fosfomycin. The MIC and zone of inhibitions for disk diffusion were noted according to the CLSI protocol. **Results:** 158 culture positive samples were isolated out of 680 total received. *Esherechia Coli (E. coli)* (74.1%) being the most isolated organism. In comparison of disk diffusion and agar dilution, categorical agreement for Levofloxacin, Cotrimoxazole, Nitrofurantoin and Fosfomycin were (82.28%, 72.15 %, 87.97% and 82.28%) respectively. Kappa coefficients of (0.64, 0.43, 0.57 and 0.37) ($p < 0.0001$) were calculated for Levofloxacin, Co-trimoxazole, Nitrofurantoin, and Fosfomycin respectively, revealing considerable level of agreement for these antibiotics. **Conclusions:** It was concluded that Agar dilution is more precise than disk diffusion but being more labor intensive and technical. Disk diffusion can still produce significantly accurate results with less resource consumption.

INTRODUCTION

The increasing prevalence of antibiotic resistance (ABR) in healthcare settings and the community at large, poses a threat to the profound advantages of having availability of antibiotic therapy. We are currently combating illnesses that are practically incurable as a result of resistant bacteria [1, 2]. The inability of common infection treatments and the rise in bacterial resistance necessitate determining the root causes of the issue as well as finding ways to mitigate it and increase the efficacy of infection therapies. One potential factor contributing to treatment failure is drug selection, particularly when drugs are inadequately chosen and administered [3]. An important concern to worldwide mortality and financial burden is ABR. Developing countries are more affected by the widespread misuse of antibiotics, for purposes other than human medicine, low-quality pharmaceuticals, inadequate monitoring, and elements of individual and societal poverty. Additionally, resistance needs to be managed before we run out of strategies to combat it because there aren't any novel treatments available [4]. ABR has been

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increasing in numerous types of infections and is associated with worse outcomes, including persistent symptoms, recurrent visits to the doctor, and disease progression due to growing infection [5, 6]. The strategies that will eventually be required to control resistance include drug discovery, resistance analysis, and combinations of new techniques to diminish resistance [7, 8]. A crucial part of therapeutic medicine is carried out by antimicrobial susceptibility testing (AST). In the areas of resistance surveillance, epidemiological investigations of susceptibility, comparative assessment of novel and established drugs, in vitro efficaciousness of medication combinations, and clinical infection management, quantitative approaches for AST are very helpful. To find the minimum inhibitory concentration (MIC) of antimicrobial drugs, three procedures are now used: broth microdilution and macrodilution, gradient diffusion (Epsilometer test) and agar dilution [9]. Susceptibility determination by the Kirby-Bauer disk diffusion is achieved by placing antimicrobial disks on a Mueller-Hilton (MH) media with pathogenic bacteria grown onto it, absence of growth around the disk deems it susceptible to the antibiotic [10]. The E-test is a modified form of disk diffusion with different concentrations on a same strip gives the results of MIC breakpoints. It allows an antimicrobial gradient to diffuse from coated strips onto an agar surface and at the intersection of the zone of growth inhibition and the strip that is considered as the value and expressed in µg/ml. When examining any errors that may have occurred from using disk diffusion tests alone, determining the MIC using either E-strips or dilution tests can be significant [11]. Agar dilution or the gradient methods are now the recommended methods by the CLSI. Although the agar dilution method is quite labor-intensive and technically difficult for everyday laboratory use, it is a valuable tool for surveillance and assessment. Gradient tests are useful for single experiments and are convenient in standard laboratory settings. The gradient tests are expensive while disk diffusion is an easy and affordable process to use [12].

This study was conducted to compare and interpret antibiotic susceptibility of organism isolated from Urinary tract infections (UTI) by agar dilution and disk diffusion methods.

METHODS

The study was conducted in Khyber Girls Medical College (KGMC) Peshawar, colonies of culture positive urine samples were collected from patients who were advised urine culture in Mardan Medical complex, Mardan (MMC) for a total duration of 6 months from April 2022 to September 2022. The study was approved by the ethical committee letter no. 9039/PGMED/KGMC. Prevalence of UTI in a study conducted previously in this province was 11.6% hence by Goldberg's Equation the sample size was of 158 samples [13, 14]. The CLSI guidelines were followed for bacterial identification and AST (M100-S31) (M07-A9) [15, 16]. Urine samples were inoculated on cysteine lactose electrolyte deficient agar (CLED) deferential media and colonies from cultured organisms were subjected to gram staining and BIOMÉRIEUX® API® 10S kits were utilized for identification of bacteria. The disk diffusion was performed using Thermo ScientificTM OxoidTM antibiotic discs of Co-trimoxazole, Levofloxacin, Nitrofurantoin and Fosfomycin with zone of inhibitions in diameters recorded as ≥16mm, ≥31mm, ≥17mm and ≥16mm respectively [15]. MH agar was utilized for both disk diffusion and agar dilution. Antibiotic stock solutions of 5 serial dilutions were prepared. Raw antibiotic powders were purchased directly from manufacturer, and antibiotic solutions containing 1000µg/ml of co-trimoxazole, 10µg/ml of levofloxacin, 1020 µg/ml of nitrofurantoin, and 1020µg/ml of fosfomycin were made. For inoculation 0.5 McFarland standard solutions were prepared from stock solutions and 2µl of this inoculum ware placed on agar plates. After incubation for 24 hours at 37Co the MIC and zone of inhibitions for disk diffusion were noted. By calculating the percentages of agreement (determining the percentages of isolates being sensitive and resistant by both the methods) and Kappa coefficient was used for calculating level of agreement. Isolates sensitive by disk diffusion and resistant by agar dilution were labeled as very major error while resistant by disk diffusion and sensitive by agar dilution were labeled as major error. SPSS® version 25.0 was used for analysis.

RESULTS

The organisms that were identified and represented in table 1. *E. coli* (74.1%) being the most isolated organism (table 1).

Table 1: Spectrum of Isolated Organisms

Isolated Organisms	Frequency (%)
E.coli	117 (74.1)
Klebsiella	17 (10.8)
Pseudomonas	8 (5.1)
Enterococci	10 (6.3)
Proteus species	4 (2.5)
Citrobacter	2 (1.3)
Total	158

The number of organisms that showed the MIC values at different concentrations were, for Co-trimoxazole at 40µg/ml (122), 80µg/ml (17) and 100µg/ml (19), for Levofloxacin at 0.5µg/ml (80), 1µg/ml (3), 2µg/ml (43) and 4µg/ml (32), for Nitrofurantoin at 32 µg/ml (134), 64 µg/ml (2) and 128 µg/ml (22) and for Fosfomycin at 64 µg/ml (142), 128 µg/ml (1) and 256 µg/ml (15), The intermediate sensitivity

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was considered as sensitive, while all the resistant concentrations were combined, The susceptibility of antibiotics against isolated organisms by disk diffusion and agar dilution (table 2).

Table 2 : Study Antibiotics' Susceptibility Rates as Determined by MIC and Disk Diffusion

Antibiotic	Susceptibility	MIC (%)	Disk Diffusion (%)
Levofloxacin	S	83 (52.5)	65 (41.1)
	R	75 (47.4)	93 (58.8)
Co-trimoxazole	S	122 (77.2)	82 (51.9)
	R	36 (22.7)	76 (48.1)
Nitrofurantoin	S	137 (86.7)	126 (79.7)
	R	21 (13.2)	32 (20.2)
Fosfomycin	S	143 (90.5)	121 (76.5)
	R	15 (9.4)	37 (23.4)

MIC by agar dilution, S-Sensitive, R-Resistant

In comparison of Disk Diffusion and Agar dilution, categorical agreement for Levofloxacin, Cotrimoxazole, Nitrofurantoin and Fosfomycin were 82.28%, 72.15 %, 87.97% and 82.28% respectively. Kappa coefficients of 0.64, 0.43, 0.57 and 0.37 ($p < 0.0001$) were calculated for Levofloxacin, Co-trimoxazole, Nitrofurantoin, and Fosfomycin respectively, showing a high degree of agreement for selected antibiotics (table 3).

Table 3 : Disk Diffusion and Agar Dilution Analysis as Susceptibility Methods, Reporting the Correlation and Categorical Agreement Levels

Antibiotics	Percentage of categorical agreement	Kappa Co-efficient r (p-value)
Levofloxacin	82.28	0.64 (0.0001)
Co-trimoxazole	72.15	0.43 (0.0001)
Nitrofurantoin	87.97	0.57 (0.0001)
Fosfomycin	82.28	0.37 (0.0001)

Levofloxacin, Co-trimoxazole, Nitrofurantoin, and Fosfomycin revealed the very major error rates as 5, 2, 4 and 3 respectively, while a higher number of major error rate 26.5 % was observed for Co-trimoxazole (table 4).

Table 4 : Distribution of Error Rates in Susceptibility Testing

Antibiotics	Positive by DD & negative by Agar Dilution	Negative by DD & positive by Agar Dilution
	VMA (%)	MA (%)
Levofloxacin	5 (3.14)	23 (14.5)
Co-trimoxazole	2 (1.26)	42 (26.5)
Nitrofurantoin	4 (2.53)	15 (9.49)
Fosfomycin	3 (1.89)	25 (15.8)

(VMA)- Very major error, (MA)- major error, (DD)- Disk Diffusion

DISCUSSION

It's important to understand the impact of antibiotics on not just individual health, but also on a global scale. Antibiotic resistance occurs when bacteria evolve and adapt to the antibiotics designed to kill them, making the antibiotics less effective. This can lead to longer infections, increased healthcare costs, and even higher mortality rates. To rationalize the usage of antibiotics, it's essential to consider not only the immediate benefits to an individual but also the long-term consequences for community health and the environment [17]. This study was conducted to compare and interpret antibiotic susceptibility of organism isolated from Urinary tract infections (UTI) by agar dilution and disk diffusion methods. The MIC values for the analyzed antibiotics were determined in this research using a comparison of disk diffusion and agar dilution, which showed remarkable agreement between the two techniques. We found a substantial correlation between the agar dilution method and the disk diffusion method ($p < 0.0001$). Our results of higher values of Kappa coefficient (0.37- 0.64) were in line with a study conducted on Neisseria gonorrhea which reported 0.89, although the organism was different the susceptibility testing had similar higher kappa index [18]. The categorical agreement between disk diffusion and agar dilution were (72.15% - 87.97%). A study of USA was reported such high concordance of disk diffusion to agar dilution with categorical results (90.4% - 93.0%) [19]. These findings as certain the reliability of either test with each other, yet higher levels of major errors were observed for Co-trimoxazole (26.5%). This may be attributed to the misreading of faint haze in zone of inhibition in disk diffusion method as CLSI guidelines recommends the reading of faint haze for co-trimoxazole [15, 16]. The very major errors were observed to be only (1.2% - 3.14%). The antibiotic susceptibility was observed to be higher with agar dilution than disk diffusion. The CLSI recommends agar dilution as standard and many studies comparing agar dilution with disk diffusion also showed similar results [18-20].

CONCLUSIONS

Agar dilution to be more precise than disk diffusion but being more labor intensive and more technical, disk diffusion can still produce significantly accurate results with less resource consumption.

Authors Contribution

Conceptualization: HQ, MAR, SLS
Methodology: HQ, MAA, MI
Formal analysis: MAR, SN, MI, SLS
Writing-review and editing: HQ, MAR, SN, MAA, MI, SLS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

COVID-19 in Dialysis and Kidney Transplant Patients

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ABSTRACT

COVID-19 problems are more common in recipients of kidney transplants. There is, however, a dearth of information on the likelihood of allograft damage or death in kidney transplant recipients recuperating with COVID-19. **Objective:** To investigate the effect of Covid-19 on kidney transplant and dialysis patients. **Methods:** This Retrospective study was conducted at Department of Medicine, Avicena Medical College, Lahore from 1st October 2022 to 31st March 2023. One hundred patients with age >18 years being kidney patients diagnosed with kidney failure or had a kidney allograft were included. Patients were grouped as either kidney transplant (Group A) or hemodialysis (Group B) where both groups were Covid-19 positive on diagnosis. The score represented 1 as fit and 9 as terminally ill. Any comorbidity related with these patients apart from the kidney failure was recorded including their obesity level. The eGFR (estimated glomerular filtration rate) was considered as zero in dialysis cases with residual diuresis ≤ 200 mL/day and 5 mL/min/1.73 m2. **Results:** There were 40% kidney transplant patients positive with Covid-19 infection and 60% with hemodialysis having positive Covid-19 infection. Majority of the patients in both groups A and B were males with a percentage of 57.5% and 59.4% respectively. The clinical frailty score was higher in group B than A. Odds ratio results showed that 28 days probability risk ratio of death was higher in the kidney transplant group A patients suffering from Covid-19 virus than hemodialysis. **Conclusions:** Kidney transplant cases have higher severity of complication and death in cases where patients become corona virus positive.

INTRODUCTION

With the emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) kidney transplant recipients are at higher risk of this deadly infection due to their usage of immunosuppressive agents. Cases of COVID-19 vary from country to country on the basis of their testing capacity, case ascertainment and public health policy [1-5]. Coronavirus virus disease had laid an adverse effect on organ transplantation, worldwide. It particularly effect large group of kidney transplant recipients and resulted into its related mortalities and morbidities. Substantial reduction in kidney transplant also occur during this pandemic to avoid and minimize the chances of COVID-19 exposure but on the other hand, leads to more severe disease or fatal outcome [6-8]. Kidney transplant patients with varying severity of the disease often leads to death and making it difficult to assess the exact cause and associated factors of corona virus disease mortality. Advanced age is considered as an additional risk factor of mortality and patients of this age are immuno-compromised and already prone to various diseases. Studies have reported that, kidney patients of age >70 years had higher chances of associated mortality [9-13]. Another complicating factor in chronic kidney patients is how they are diagnosed for COVID-19. Screening of corona virus in immunosuppressed patients should not only rely on confirmation by sign and symptoms but routine

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surveillance after contact with infected or suspected person. Differential effect of COVID on different ethnicities is crucial for policy making regarding patient care of kidney failure patients [14]. Only limited number of data are available regarding consequences of kidney replacement therapy. Chronic kidney disease patients are particularly at high risk due to underlying condition including diabetes, hypertension, and cardiovascular disease.

Present study is designed to find the association and risk factors of kidney transplant and dialysis with corona virus disease.

METHODS

This retrospective study was conducted at Department of Medicine, Avicena Medical College, Lahore from 1st October 2022 to 31st March 2023. The patients age was >18 years and were kidney patients diagnosed with kidney failure or had a kidney allograft were included and those patients who had renal carcinoma or already critical before Covid19 infection were excluded. Fisher's formula was used to estimate the sample size. Z 2 pq e 2 = n where the intended sample size, n, is Z is the standard deviation at the required accuracy level, or 1.96 at the 95% accuracy level. These patients were diagnosed with coronavirus infection through PCR nasal swab test. Detailed demographic and clinical information of each patient was documented. Clinical frailty score was used to assess frailty of each patient. A total 100 cases were enrolled. These cases were divided into two groups depending upon that either they had kidney transplant or they were on hemodialysis. The kidney transplant patients were designated as group A and hemodialysis as group B. The score represented 1 as fit and 9 as terminally ill. Any comorbidity related with these patients apart from the kidney failure was recorded including their obesity level. The eGFR was considered as zero in dialysis cases with residual diuresis ≤200 mL/day and 5 mL/min/1.73 m2. The primary-outcome of the study was vital conditions at day 28 of infection. These outcomes included either patient was still in critical care unit, intensive care, hospitalized or discharged. The Student's t-test was utilized to compare characteristics between groups for continuous data, and the Pearson chi-square test was employed for categorical variables. Data were analyzed by SPSS version 26.0.

RESULTS

There were 40% kidney transplant patients positive with Covid-19 infection and 60% with hemodialysis having positive Covid-19 infection. Majority of the patients in both groups A and B were males with a percentage of 57.5% and 59.4% respectively. The mean age of the patients was 55 ± 15 years in group A while 67 ± 14 years in group B (Table 1).

Table 1: Demographic Information of the Patients

Characteristics	Kidney Transplant (n=40)	Hemodialysis (n=60)	p-Value
Gender N (%)			
Male	23 (57.5%)	38 (59.4%)	0.17
Female	17 (42.5%)	22 (36.6%)	
Age (Mean ± S.D)			
Age (years)	55 ± 15	67 ± 14	<0.001
BMI (kg/m^2)	27.1 ± 5.1	26.5 ± 5.8	0.34

The clinical frailty score presented a significant difference between kidney transplant Covid-19 positive patients in comparison with hemodialysis Covid-19 positive patients. Obesity, diabetes and coronary heart diseases were higher in group B than group A (Table 2).

Table 2: Comparison of Clinical Fatality Score and Comorbidities in Groups A and B

Characteristics	Kidney Transplant (n=40)	Hemodialysis (n=60)	p-Value
Clinical Fatality Score (Mean ± S.D)	3.0 ± 1.6	4.0 ± 1.7	<0.001
Comorbidities N (%)			
Obesity	9 (22.5%)	13 (21.6%)	0.70
Hypertension	34 (85%)	49 (81.65)	0.14
Diabetes Mellitus	11 (27.5%)	25 (41.6%)	<0.001
Coronary Artery Disease	6 (15%)	21 (35%)	<0.001

Odds ratio results showed that 28 days probability risk ratio of death was higher in the Kidney transplant group A patients suffering from Covid-19 virus than hemodialysis. The rate of hospitalization was higher in group A as well as ICU admissions were more common than group B (Table 3).

Table 3: Death Related Risk Comparison between Groups A and B

Characteristics	Kidney Transplant (n=40)		Hemodialysis (n=60)	
	Percentage (%)	95% CI	Percentage (%)	95% CI
28 Days Death Probability	23.8%	21.6–26.5	16.8%	13.9–20.5
Hospitalization Risk	16%	1.20 (1.00–1.47)	13%	1.0 (0.9-1.2)
ICU Admission	19%	2.4 (1.35–3.9)	15%	2.38 (1.33–3.29)

The residual diuresis greater or equal to 200 ml/day was only presented in group B as 32%. Patients underwent kidney transplant were majorly having primary glomerulonephritis while diabetic kidney disease was more common in hemodialysis cases (Figure 1).

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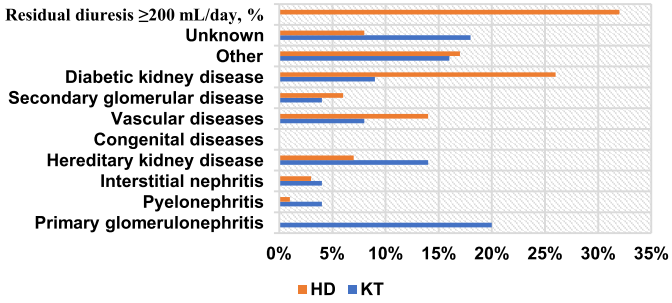

Figure 1: Frequency of Various kidney Complications in Hemodialysis and kidney Transplant Cases

DISCUSSION

From the beginning of the outbreak of corona virus, it's a matter of discussion whether immune-compromised patients are more prone to complications related to COVID-19. This study is specifically designed to analyze the burden of corona virus on nephrology community. Corona virus is particularly fatal in kidney replacement therapy or chronic kidney disease patients [15-17]. There were majority males with mean age 63.5 years had mean BMI 27 lg/m2 in our study. These findings were in line with previous studies conducted by Li MT *et al.*, and Goyal P *et al* [7-9]. Comorbidities were also widely present in current study which further worsens the situation. These results were not expected as higher age group patients were more in number. Moreover, diabetes, obesity and cardiovascular diseases all are related with COVID-19 death in addition to chronic kidney diseases. All these together deteriorate already underlying condition and escalate the death chances upto10 fold [15-18]. The clinical frailty score presented a significant difference between kidney transplant Covid-19 positive patients in comparison with hemodialysis Covid-19 positive patients. These were comparable to the studies conducted in past in which significant differences were seen in patients with hemodialysis [18, 19]. Supportive care is considered a mainstay for the prevention and treatment of corona virus. Kidney transplant patients were often visited hospitals and admitted in intensive care unit as compared to dialysis patients. Frequent hospital visits exacerbate the chances of COVID-19 exposure. Mortality rate was also varied among dialysis and kidney transplant group. Other studies also proved that significant death were reported in dialysis patients. This could be possible as advanced care was offered to transplant patients. Effective policy should be formulated to minimize the exposure of COVID-19 and to prevent the death associated with chronic kidney diseases [19-21].

CONCLUSIONS

Kidney transplant cases have higher severity of complication and death in cases where patients become corona virus positive.

Authors Contribution

Conceptualization: MA
Methodology: MA, AMQ
Formal analysis: MA, AMQ, SSAT, PK
Writing, review and editing: MA, SSAT, AN

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Analysis of Different Treatment Approaches to Prevent Alveolar Osteitis

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ABSTRACT

Alveolar Osteitis (AO) is a complication that can arise after tooth extraction. It refers to a socket following extraction that lacks epithelium, blood clot, and has an exposed bony surface, often causing intense and radiating pain. **Objectives:** To determine the incidence of AO among different treatment groups undergoing tooth extraction. **Methods:** A prospective comparative study was conducted. Patients were enrolled and allocated into treatment groups: Control, Saline Irrigation, and chlorhexidine (CHX) Rinse. Outcome measures included the incidence of AO. Statistical analysis was performed to compare outcomes between treatment groups. **Results:** The overall occurrence rate of dry socket was 14.22%, with the highest incidence observed in patients who received saline irrigation. Conversely, the use of chlorhexidine rinse once postoperatively resulted in the lowest incidence rate. **Conclusions:** It was concluded that post-operative use of chlorhexidine rinse shows a promising and favorable outcome in preventing AO among patients. However, this study does not support the justification for irrigation with saline. Further well-designed clinical trials are necessary to validate these findings.

INTRODUCTION

Alveolar Osteitis (AO) referred by the term "Dry socket" is the most common complication that may occur following routine simple exodontia [1]. It can be described as a "postoperative pain in and around the extraction site, which increases in severity at any time between 1 to 3 days after the extraction accompanied by a partially or disintegrated blood clot within the alveolar socket with or without halitosis"[2]. Various models have been proposed about its pathogenesis. which elucidates the role of plasmin-associated fibrinolytic activity in the breakdown of blood clots, is widely accepted [3]. The prevalence of dry socket varies across different studies and is extensively examined concerning various risk factors such as smoking, gender, oral contraceptive use, and traumatic extractions, which are known to contribute to its occurrence [4]. The literature reports incidence rates ranging from 1% to 70% for any teeth and between 20% to 30% for third molars [5]. In the realm of preventing Alveolar Osteitis, numerous strategies have been proposed and explored in the existing literature. These approaches encompass a diverse range of interventions aimed at minimizing the risk of this post-operative complication. Among the preventive measures cited in research are the administration of antibiotics, chlorhexidine rinses, gelatamp, anti-fibrinolytic agents,

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antimicrobial photodynamic therapy, and low-level laser therapy [6, 7]. Despite the abundance of literature on prevention techniques, the efficacy of post-operative irrigation with normal saline remains a contentious issue. Scholars have presented conflicting findings and perspectives, leading to an absence of consensus on this particular intervention. Consequently, clinicians are faced with a challenging task in determining the most effective approach for their patients [8, 9]. Management strategies for preventing AO are commonly classified into two primary categories: dressing and non-dressing management. Each of these categories encompasses distinct protocols and considerations, further adding to the complexity of decision-making in clinical practice. Given the importance of preventing AO to ensure optimal post-operative outcomes, ongoing research and clinical evaluation of preventive measures are essential [10, 11]. The non-dressing interventions include removal of any suture (if present) to allow for exposure of the wound site, irrigating the site with isotonic saline or local anesthetic solution, prescribing oral local analgesics and instructing on home irrigation until the socket no longer collects any debris [12-14]. Dressing management includes placement of a self-eliminating dressing such as alvogyl, obtundent dressing such as zinc oxide, eugenol, and lidocaine gel or a combination of these therapies [15, 16]. The rationale for our study lies in the need to identify the most effective treatment approach for preventing AO following tooth extraction.

This study was conducted to provide valuable insights into optimizing postoperative care and reducing the incidence of this painful condition. As the incidence of dry socket is quite high, and various aspects unclear, we want to take our steps in finding a method to decrease the occurrence for the benefit of patients and doctors.

METHODS

A prospective comparative study was conducted from September 2022 to 25 March in Department of Dentistry, Ghurki Trust Teaching Hospital, Lahore, Pakistan. after approval from the respective Ethical Committee (Case#501/ERC/CMH/LMC, Date:24-09-2022). Sample size of 255 participants, were calculated by using World Health Organization (WHO) calculator to keeping confidence interval of 95% and Power of test 80% taking anticipated frequency of AO to be 15.7% in such cases [17]. The study recruited a healthy sample of patients aged 25 and 60 years and above, presenting with a history of tooth extraction and at risk for AO development. Patients with good oral hygiene (Silness-Loe Plaque Index:0 or 1), non- smoker's patients and those requiring extraction of molar and pre-molar tooth; both in the mandible and maxilla were included in the study. Patients with a history of systemic diseases affecting bone metabolism or pregnancy were excluded from the study. Participants were allocated into 3 different treatment groups using a predetermined allocation method. The interventions were as follows in Control Group: Patients received standard postoperative care without any additional interventions. Saline Irrigation Group: Patients underwent postoperative irrigation with normal saline solution (0.9% NaCl). CHX Rinse Group: Patients performed postoperative rinsing with chlorhexidine mouthwash. The primary outcome measure was the incidence of AO within the first postoperative week. Following tooth extraction, patients were followed up for a period of one week. During follow-up visits, participants were assessed for the presence of AO. All the patients were prescribed tablet (Panadol 500mg) as a rescue medicine. Record of the patient presenting with dry socket was made and assessed for the severity via visual analogue scale (VAS) pain scale and clinical signs and symptoms. The VAS pain scale consists of a horizontal line, typically 10 centimeters in length, anchored by verbal descriptors at each end representing the extremes of pain intensity 'no pain' and 'worst pain imaginable'. Patients were instructed to mark their level of pain on the line, with measurements taken in millimeters from the left end. In addition to assessing pain intensity using the VAS pain scale, clinical signs and symptoms of dry socket were systematically recorded and evaluated during follow-up visits. Patients not reporting back to the departments were followed up via a telephonic call to ask for their dental and general well-being post-extraction. Data analysis was conducted using the statistical package for the social sciences (SPSS) version 25.0. Descriptive statistics were used to summarize baseline characteristics of participants. The incidence of AO compared between treatment groups using chi-square tests.

RESULTS

Although 255 patients were selected for the study, no possible follow up was made. Hence, the following results are for 225 patients 91(40.44%) were male and 134(59.56%) were female. The incidence of dry socket was higher in females. The age distribution was between 25-65 years of age. The patients were divided into 3 age groups i.e. 25-35years of age=59(26.22%), 36-45years of age=78(34.66%) and 46-60 years of age=88(39.11%)(table 1).

Table 1: Distribution of Participants by Gender and Age

Variable	Type	N (%)
Gender	Male	91(40.44%)
	Female	134(59.56%)
Age	25-35 years	59(26.22%)
	36-45 years	78(34.66%)
	46-60 years	88(39.11%)

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In the Control group, 11 patients (5%) had AO out of a total of 60 patients, while in the Saline Irrigation group, 19 patients (8%) out of 100 experienced alveolar osteitis. The CHX rinse group had the lowest incidence, with only 2 patients (1%) out of 65 affected. Statistical analysis revealed significant differences among the treatment groups ($p < 0.05$, Chi-square test).

Table 2: Incidence of AO in Different Treatments Groups

Group	Patients with Alveolar Osteitis	Patients without Alveolar Osteitis	Total	p-value
Control	11 (5%)	49 (22%)	60	0.032
Saline Irrigation	19 (8%)	81 (36%)	100	0.001
CHX Rinse	2 (1%)	63 (28%)	65	0.004
Total	32 (14.22%)	193 (85.77%)	225	-

(Chi-square test, observed difference was statistically significant)

DISCUSSION

The main idea was to improve the standard of care at the dental chair and reduce the incidence of AO after simple exodontia. The study assessed and compared two heavily investigated interventions in the prevention of alveolar osteitis; CHX rinse and saline irrigation. Our results favored CHX one-time post-operative rinse. The intervention is quite convenient and economical. Furthermore, our results did not favor saline irrigation as a standard of care in preventing dry socket. The literature was concentrated on assessing the different regimens and forms of CHX in the prevention of AO [17]. CHX as rinse, gel and an irrigant has been evaluated. CHX is an effective antiseptic and targets Gram-positive and negate aerobes and anaerobes [18]. In our knowledge, no study has shown the effectiveness of immediate post-operative CHX rise. In contemporary practice, the regimens are followed [19]. CHX in gel form applied into the socket or soaked in sponges is the most effective method as it does not depend on patient's compliance and has a long pharmacological action [20]. However, the gel or soaked sponges are not prescribed routinely due to cost ineffectiveness [21]. Saline irrigation in the prevention of dry socket is a controversial notion. A study done using a 20ml saline irrigation post-operatively reported reduced incidence of AO when compared to a control group [22]. A study concluded the amount of saline used for lavage and the incidence of AO [23]. Another study also validates the association of AO and the amount of saline used for lavage; larger the amount, lesser the incidence of AO [24]. The strengths of our study include blinding of the principal investigation, randomization, telephonic follow-up, exclusion of variables that may influence the occurrence of AO and easy to do chair-side interventions. In our knowledge, no clinical trial has been done that assessed the efficacy of our interventions in simple exodontia and their association with AO. The limitations of the study include relying on a sample size that was not calculated using a statistical calculator, allocation concealment was not done and the clinical groups not having the same number of participants. We also realized that the interventions made different natures like a rinse being compared to an irrigation. Our shortcomings call for further research to improve the in-office standard of care.

CONCLUSIONS

Chlorhexidine one-time post- operative rinse is most effective in preventing AO and that saline irrigation 5ml one time is the least wanted with the highest incidence of AO. However, more studies and quality RCT are needed to further attest to our conclusion as this regimen was not followed previously in the literature.

Authors Contribution

Conceptualization: MSS
Methodology: MN, YI, TS
Formal analysis: AJS
Writing-review and editing: SS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Comparison of Discectomy versus Sequestrectomy in Lumbar Disc Herniation: A Retrospective Cohort Study

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ABSTRACT

Lumbar disc herniation is a common spinal condition characterized by the protrusion or extrusion of intervertebral disc material. This extruded or protruded disc material compresses the spinal nerves causing various symptoms such as low back pain radiculopathy and functional limitation. **Objective:** To assess and compare the outcomes of pain relief as well as functional improvement among patients who underwent Discectomy and Sequestrectomy. **Methods:** A retrospective cohort study was conducted at the neck and surgery department, Combined Military Hospital (CMH), Quetta. A total of 80 patients were included in the study, 26 (32.5%) patients underwent Sequestrectomy while microdiscectomy was done in 54 (67.5%) patients. The data collection proforma consisted of demographic information, baseline clinical characteristics, description of surgical procedures, pre and postoperative VAS scores, and functional outcomes assessed by the Oswestry disability index. The statistics used in this study were independent t-test and paired t-tests. **Results:** The study results showed no significant differences in the baseline characteristics between the groups. Both procedures showed a significant improvement in pain levels, in terms of lowered VAS scores and ODI scores. **Conclusions:** The procedure of sequestrectomy has shown significant improvements in postoperative pain relief and functional outcomes as compared to microdiscectomy.

INTRODUCTION

Lumbar intervertebral disc herniation is an anatomical abnormality, characterized by the extrusion of the nucleus pulposus, a soft middle portion of an intervertebral disc, through a tear in the outermost disc fibrous ring called the annulus fibrosus. A disc herniation is a general term for a series of problems involving disc protrusion outside of the interstitial space, including bulges, extrusion, and sequestration [1]. WHO indicates that lumbar disc herniation is the most frequent cause of back discomfort condition. An estimated 619 million people worldwide suffer from back pain, with a rising trend to 843 million by 2050, driven by population growth and aging [2]. Surgical interventions are commonly indicated when conventional treatments do not relieve the pain or if the patient develops neurological deficits [3]. The two major surgical intervention types for LDD are discectomy and sequestrectomy. They differ in terms of surgical technique used and goals pursued. The surgical treatment of choice for symptomatic LDD-causing radiculopathy is microdiscectomy with an interlaminar approach. The technique consists of partial removal of particular bone structures, such as the facet joints and ligamentum flavum, after which the intervertebral disc material is extracted. Hence, microdiscectomy is the most effective and primary "gold standard" choice in meeting the surgical needs of such patients [4]. The reason for this aggressive approach is that as long as degenerated disc material is left in the intervertebral space, the probability of developing reherniation rises significantly. When this occurs, the exogenic disc material can compress the root nerve,

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causing the symptoms to reoccur. Hence, surgeons tend to remove exogenic disc material quite aggressively and substantially. Nevertheless, there is a growing body of evidence indicating that the postoperative reduction in disc height can lead to intervertebral instability [5, 6]. A reduction in intervertebral disc height corresponds with the relaxation of ligaments and articular capsules, potentially leading to segmental instability and ultimately hastening the development of spondylosis. This condition could contribute to the occurrence of "failed back syndrome". Thus, causing further pain and disability [7, 8]. Williams in 1978 presented a breakthrough minimally invasive spine technique called Sequestrectomy. He reported that conservative surgery might be implemented in the presence of primary herniated lumbar discs. The method was implemented by the direct puncture of the fibrous ring. No incisions or the curettage of the disc space were required [9]. Recently, conservative surgery has been a topic of research to perform minimalistic removal of intradiscal material. One of the solutions is microscopic sequestrectomy, allowing for the removal of only the disc fragments in the present cases of herniation of the disc. The literature includes studies documenting a considerable positive outcome with no significant increase in re-herniation rates [10-12]. The importance of selecting the appropriate surgical procedure for this condition is widely acknowledged in achieving optimal pain relief, functional improvement, and overall positive patient outcomes. It is crucial to have sufficient evidence on the most effective surgical techniques for managing lumbar disc herniation. This will greatly enhance the quality of care and help clinicians make informed decisions.

The aim of the study was to assess the clinical effectiveness of discectomy and sequestrectomy in terms of pain relief and functional outcomes.

METHODS

This study was done as a retrospective cohort to assess and compare the outcomes of two surgical interventions on patients who went through a discectomy or sequestrectomy as surgical management for the treatment of lumbar disc herniation at CMH Hospital, Quetta for a specified period. The study lasted for one month, from 1 February 2023 to 29 February 2024. Participants were included in the study during their follow-up appointments at the spine surgery department. Inclusion criteria comprised patients of any age and gender, diagnosed with lumbar disc herniation (unilateral single level, between L1 and S1) confirmed through clinical examination, imaging (MRI/CT scan), and indication for surgical intervention. Patients who had undergone previous lumbar disc surgery at the same level, had longstanding spinal stenosis, presented with extraforaminal disc herniation, showed multilevel extensive lumbar spine degeneration, had incomplete medical records, or had undergone surgery at another hospital were excluded from the study. Out of the initial pool of 150 potential patients, 60 were lost to follow-up, and 10 did not meet the inclusion criteria. As a result, 80 patients were successfully recruited for the study. Patient data were extracted from medical records, including demographics (age, gender), preoperative characteristics (symptom duration, pain severity, functional limitations), surgical details (type of surgery, surgical approach), and postoperative outcomes (pain relief, functional improvement, complications, length of hospital stay). The main focus of this study was to evaluate the level of pain relief experienced by patients. This was measured using Visual Analogue Scale (VAS) scores at different time points, including before the surgery and during the follow-up period. Oswestry Disability Index (ODI) was used to assess the functional outcome in the preoperative period and follow-up visits. Analysis of data was done by SPSS Version 26.0. Discectomy and sequestrectomy cohorts' subject demographics and clinical profiles were summarized concerning the dependent variable. Using means ± S.D or median with interquartile range for continuous variables and frequencies and percentages for categorical variables. Group comparisons were performed regarding appropriate statistical tests such as t-tests and paired tests for varying continuous outcomes. Ethical consideration: the authors were able to follow ethical procedures in research and obtain an IRB, in addition to confidentiality in patient information, keeping all the data anonymous.

RESULTS

The comparative study between the Sequestrectomy group (26 patients) and the Microdiscectomy group (54 patients) revealed notable findings. Gender distribution and mean age did not significantly differ between the groups ($p = 0.08$ and $p = 0.09$, respectively). Follow-up duration also showed no significant difference ($p = 0.06$). These results indicate that there were no statistically significant differences between these groups based on the baseline data. However significant differences were observed in surgical levels, particularly at L4-5 ($p = 0.04$) and L5-S1 ($p = 0.05$), indicating variations in surgical approaches between the groups table 1.

Table 1: Demographic Characteristics of the Study Sample

Variables	Sequestrectomy Group (n=26)	Microdiscectomy Group (n=54)	p-Value
Gender (Male, Female Ratio)	17:9	39:15	0.08
Demographic and Clinical Characteristics N (%)			
Age	41.7 (6.2)	39.2 (10.4)	0.09
Follow-Up Duration (Months)	6.2 (6.8)	7.3 (8.3)	0.06
Hospital Stays (Days)	15.3 (7.1)	17.9 (9.0)	0.06

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Level of Surgery (%)			
L2-3	4	13	0.10
L3-4	5	10	0.06
L4-5	8	19	0.04*
L5-S1	9	12	0.05

*=P<0.05

The analysis of outcomes measures in the Sequestrectomy group (26 patients) and the Microdiscectomy group (54 patients) revealed significant improvements in pain relief and functional outcomes following surgical intervention for lumbar disc herniation. Pre-operatively, both groups exhibited high VAS scores, with the Sequestrectomy group at 7.9 ± 3.24 and the Microdiscectomy group at 8.3 ± 2.56, which significantly decreased post-operatively to 1.5 ± 0.9 and 1.9 ± 1.4, respectively (p-value = 0.00 for both groups). Similarly, pre-operative ODI scores were markedly reduced post-operatively in both groups, with the Sequestrectomy group showing an improvement from 70.1 ± 12.9 to 15.8 ± 17.2 and the Microdiscectomy group from 69.3 ± 20.1 to 21.3 ± 11.9 (p-value = 0.00 for both groups). These findings demonstrate that both Sequestrectomy and Microdiscectomy procedures led to significant reductions in pain intensity and improvements in functional outcomes, highlighting the efficacy of both surgical interventions in enhancing patient well-being and quality of life.

Table 2: Pre and Postoperative VAS and ODI Score Comparison

Outcomes Variables	Sequestrectomy Group (n=26) (Mean ± S.D)	Microdiscectomy Group (n=54) (Mean ± S.D)	p-Value
Pre-Operative VAS Score	7.9 ± 3.24	8.3 ± 2.56	0.05
Post-Operative VAS Score	1.5 ± 0.9	1.9 ± 1.4	0.04*
p-Value	0.00*	0.00*	-
Pre-Operative ODI	70.1 ± 12.9	69.3 ± (20.1)	0.06
Post-Operative ODI	15.8 ± 17.2	21.3 ± 11.9	0.03*
p-Value	0.00*	0.00*	-

Intragroup: Paired T-test, Intergroup: Independent T-test, *= P< 0.05

DISCUSSION

The usual method for neural decompression during microdiscectomy involves removing the herniated disk material, cutting out as much intervertebral tissue as possible, and scraping the endplates [13]. This approach was designed with the assumption that increasing the amount of removed disk tissue will reduce the likelihood of re-herniation [14]. The belief in the issue faced no resistance since it lacked scientific validity. The total elimination of all herniated disk material is unattainable. When this system was applied, it was inevitable that repetitive processes would occur. On the other hand, performing a forceful removal of the intervertebral disc may depend on a reduction in the height between the vertebrae. This drop is often associated with instability in the spinal segment and the advancement of spondylitis [15, 16]. This might potentially lead to a substantial rise in the occurrence of failed-back surgery syndrome and delayed complications of disk surgery after periods of no symptoms. While there is a lack of long-term studies to assess these consequences, research has shown that patients who do not have endplate curettage have a lower incidence of low back pain [17, 18]. The growing interest in conservative surgery, specifically microscopic sequestrectomy or free fragmentectomy, has led to limited clearing of intradiscal material in certain cases of disc herniations. This procedure involves a simple excision of disc fragments in a targeted subpopulation. Existing literature has reported success rates exceeding 90% without an increase in reherniation rates. Comparing these findings with our study, both Sequestrectomy and Microdiscectomy procedures yielded significant improvements in pain relief and functional outcomes post-operatively, as evidenced by substantial decreases in VAS scores and improvements in ODI scores. The success rates observed in our study align with the reported success rates in the literature for conservative surgical approaches, further supporting the efficacy of these procedures in managing lumbar disc herniation [17-19]. Both groups showed significant improvements in pain relief and functional outcomes post-surgery. Pre-operatively, high VAS scores decreased significantly in both groups, Sequestrectomy (7.9 to 1.5), Microdiscectomy (8.3 to 1.9), as did ODI scores, Sequestrectomy (70.1 to 15.8), Microdiscectomy (69.3 to 21.3). These improvements were statistically significant (P=0.00). These findings underscore the efficacy of both Sequestrectomy and Microdiscectomy in reducing pain intensity and enhancing functional outcomes in patients with lumbar disc herniation. Current findings are consistent with previous literature which shows similar findings when comparing outcomes in both surgical techniques [14-21]. Multiple studies have shown that both discectomy and sequestrectomy procedures yield similar clinical results within the initial 4 to 6 months after surgery [22, 23]. Nevertheless, it is important to mention that although these positive outcomes continue for a duration of 2 years after sequestrectomy, there is a certain level of deterioration in self-assessed clinical results after microdiscectomy. The drop is seen in the notable superiority of sequestrectomy in key metrics such as overall outcome, health-related quality of life (including physical and social functioning), and the utilization of analgesics. The findings from prior research are consistent with the conclusions of the present study, which further supports the idea that sequestrectomy may provide benefits in terms of long-term clinical results and patient

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welfare when compared to microdiscectomy [17-24]. Nevertheless, a randomized control experiment conducted by Barth *et al.*, has presented contradicting findings. The research compared lumbar microdiscectomy with sequestrectomy and concluded that there was no significant difference in the rates of reherniation throughout the 2-year follow-up period [25]. It is worth noting that long-term outcomes, particularly those beyond 5 years of postoperative follow-up, have not been assessed in any prospective or retrospective comparison studies. Therefore, to draw comprehensive and long-term comparative conclusions, prospective cohort studies must be conducted within regional contexts, considering potential variations in patient demographics, healthcare practices, and environmental factors. Based on a thorough analysis of the existing research, it appears that fragmentectomy may lead to a reduced hospital stay and therefore, expedite the recovery process. The results of the current study are consistent with this observation, providing additional evidence that fragmentectomy is linked to shorter hospital stays and faster recovery [12-19]. Huang *et al.*, reported in their meta-analysis that the duration of hospital stays in the sequestrectomy and microdiscectomy groups varied from 0.9 to 6.4 days to between 1.17 and 6.94 days, respectively. It is worth noting that the findings are significantly below their comparison with our findings [25]. Nonetheless, there's a possible explanation for the extended length of hospital stays detected in this study. Indeed, the literature review incorporated sources from multiple countries, including China. Secondary to existing differences in the health care systems, and the practices used, the four articles in the meta-analysis and the current study could have used different standards of care. In particular, hospital protocols, postoperative care, access to resources, and clinical discharge criteria might have varied. Also, individual patient variability such as other medical conditions, complications, and differing postoperative recovery rates might have impacted the hospital stay. Conducting research on these factors and a comparison of the practices between the nations might provide more information regarding the observed discrepancies.

CONCLUSIONS

Both surgical approaches resulted in a statistically significant improvement in pain and functional outcomes post-surgery. The reduction in VAS rate and increase in ODI score was statistically significant in both groups, demonstrating that both surgical procedures are effective in improving a patient's general well-being and quality of life. In comparison between the two methods, the Sequestrectomy group (P=0.04) had a higher increase in result values than the Microdiscectomy group (P=0.03). In our study, the hospital stay duration was longer than that of the previous studies.

Authors Contribution

Conceptualization: AUM
Methodology: AUM, MT, WA
Formal analysis: MS, SAQ, SI
Writing, review and editing: MS, SAQ, AUM

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Comparison of Fat Graft in Post-Burn Scars versus Platelet-Rich Plasma Regarding Scar Quality and Healing

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ABSTRACT

Post-burn scars occur when burns damage the skin leading inevitable injury. Various techniques are applied for treatments and reduction so f these scares. **Objective:** To compare the effect of Platelet Rich Plasma (PRP) and fat graft in post-burn scars on the outcome of the healing process and quality of chronic wounds. **Methods:** One hundred cases were equally divided in group I (platelet-rich plasma) and group II (fat graft), age between 20-60 years were enrolled. The patients were those who were having post traumatic or and post burn chronic wounds which were within the duration of ≥3 months. A 5cc blood was withdrawn from each patient. Fat graft and platelet rich plasma were prepared, applied and compared for up to 12 weeks for their wound size, healing rate and scar quality. **Results:** There was no difference win age or gender within groups with a mean age of 43.46 and 44.36 years in group I and Group I. The comparative analysis within the original wound size and decrease in it within the 4 weeks' time followed by 12 weeks' time presented significant variance with both procedures bringing sufficient minimizing in the size, however a slight better result was presented in group II in comparison with Group I. Average healing rate was higher in group II than group I. **Conclusions:** Both procedures are efficient in terms of scar quality and healing of post burn scar. However, within the two groups the fat graft is more efficient and reliable with high healing time and rate.

INTRODUCTION

Post Burn Scars (PBS) are unavoidable, inevitable depending upon the how deep is the burn injury. Fat grafting is a common and popular procedure within plastic and cosmetic surgery involving reconstruction of soft tissue as well as augmentation, within the various advantages related with this procedure are accessibility, versatility and non0immunogenecity [1, 2]. There have been abundant literatures highlighting the application fat grafting for contouring tissue defects, scar-softening and improvements in fibrosis [3-6]. Although there are various benefits related with fat graft however, yet the major challenge is the survival rate prediction [7]. There have been evident reports on long term resorption of graft in many patients with hypoxia and Reactive Oxygen Species (ROS) formation leading to fat necrosis and graft loss [8, 9]. The passive diffusion as well as perfusion of the surrounding tissue are the main source of nutrition for the grafted fat yet adequate neo-vascularization is considered equally significant for the survival of the graft [10, 11, 12]. With the advancement of technology various other procedures have been introduced which can control and increase the survivals rate of the graft. These procedures include Platelet Rich Plasma (PRP), Platelet Rich Fibrin (PRF), and stromal vascular fraction. These procedures can

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be opted alone or in combination with fat graft for improved result an enhance neo-vascularization [13]. Platelet-rich plasma is an autologous concentrated platelets source, for the development and regeneration of cytokines and growth factors [14-20]. There have been several studies for identifying the role and significance of PRP, however a mutual consensus is still lacking in predicting its precise significance due to lack of authentic literature [21].

The current research was designed for specifically identifying the role of fat graft in comparison with the PRP in terms of scar quality and healing in post burn patient's care. The results of this study have highlighted the prominent advantages of both the procedures with also emphasizing on comparative details which can elaborate the more appropriate procedure among the two providing better health outcomes.

METHODS

This comparative prospective study was conducted in the Department of Plastic Surgery, Lahore General Hospital, Lahore 1st January 2023 to 30th June 2023 with Institutional Review Board (IRB) Approval Number: 117-22 dated: 24th November, 2022. A total of 100 cases were selected after calculating the sample size through available sample size calculator on WHO sample calculator site. The power of test was taken as 80% while CI as 95% with 5% margin of error for calculation of sample size. The patients were divided into two groups where each group was having 50 cases in them. The group I were those patients who were given PRP treatment for burns while in group II those patients who opted fat graft as a post burn treatment were placed. Each patient was enrolled as a study participant was presented with the informed consent for signatures and concurrence. After their permission of each patient they were considered as study participants. The age of the patients was between 20-60 years. The patients were those who were having post traumatic or and post burn chronic wounds which were within the duration of ≥3 months. Those patients who were having acute wounds or any autoimmune disorder or were on anticoagulant treatment, suffering from diabetes, hepatic disorders, renal failure or pregnant were excluded from the study. Chronic wounds as a consequence of malignancy were also excluded from the study. All chronic wounds were debrided initially for the removal of the necrotic tissue and for the preparedness of the wound bed. All demographic and clinical details were entered in a well-structured questionnaire. The evaluation of each wound was properly conducted before any treatment procedure. Clinically clean wound was assessed through the case definition wherein it had a clean bed with tissue granulation pinkish to red in color, soft, painless and having no necrotic discharge or odor. In unhealthy tissue initially, the culture sensitivity was performed and bacterial count assessed. In cases of 10 org/gm tissue the patients were considered as excluded. A 5cc blood was withdrawn from each patient. In group I the blood was centrifuged at 3000 rpm for 3 min with the acellular plasma as the top most layer comprising of 40% of the acellular plasma is termed as Platelet Poor Plasma (PPP). This layer is followed by the "buffy coat" middle layer made of 5% of the total volume. Whereas the last layer comprising 55% of the total acellular plasma is made of red blood cells layer. When the primary centrifugation is complete then the topmost layer is removed through sterile-syringe and middle layer is transferred in another sterile tube wherein extra care is taken in not including the bottom red blood cells with the middle layer. The bovine thrombin is than mixed in the middle layer (PRP) with a PRP ratio of 1cc per 0.2 ml and 0.1ml calcium chloride. Within the group II lower abdomen liposuction was performed under general anesthesia and the collected fat was emulsified through mechanical force and used for fat graft. The fat graft harvesting was done through blunt tip cannula which was 3mm dm and connected with the 10cc Leurlok syringe. The isolated 3 layers post 3000 rpm centrifugation consisted of top oily layer, middle fat graft while lower as fluid layer for decant. The middle layer was again emulsified mechanically between 1mm leurlok syringes approx. up to 30 times. PRP or fat graft were applied on wound area through 2 ml per cm2, which was further followed by the Vaseline gauze application and dressing. Within the Group I the preparation was freshly done as twice per week. The amount of fat prepared is only once in Group II and was around 500-600cc with 50cc stored amounts at –20°C. The amount of fat applied depended upon the chronic wound. Each fat sample was thawed at room temperature 15 minutes prior application. Wound surface region was calculated through the measurements of the wound width as well as wound length. Then the healing rate of the wound was calculated. All dimensions were measured using metric tape at the first visit and then every week. The healing rate was calculated as follows: Original wound area (cm2) – remaining wound area (cm2) ×100/original wound area [21]. Images were taken before and after the initiation of the treatment and during the follow up visits on the 4th week and on the 12th week of initiation of the post treatment method. Histopathological assessment of the healing in both groups was performed by applying a punch biopsy that has been taken from the wound including the edge and the bed on the 1st visit and the 4th week in both groups to be compared. The other assessment regarding peri-lesions skin quality such as pliability, the depth of wound and erythema were also evaluated. The approach used to examine wound healing histology involved creating a cutaneous wound of specific depth and size and consequently monitoring its size over time [22]. The rate of

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re-epithelisation was often calculated in these studies. The histological data obtained in all of these experiments were the secondary outcome to the clinical endpoint of the wound healing or the flap/graft surviving. The pain evaluation was performed through patient questioning using Visual Analogue Scale (VAS) scoring method which ranged from 0-10 wherein 0 indicated no pain while 10 meant worst pain. Histopathological assessment at 4th week through edge and in-depth wound punch biopsy was also conducted in both groups. Data were statistically analyzed using SPSS version 25.0. T test and Chi square was applied for comparing groups. p Value of <0.05 was taken as significant.

RESULTS

There was no difference win age or gender within groups with a mean age of 43.46 and 44.36 years in group I and group II. Males prevalence was higher in both groups. The etiology explained the presence of full thickness burn in 60% group I and 52% group II cases (Table 1).

Table 1: Comparison of Age, Gender and Etiology in Both Groups (n=100)

Variables	Group I (n=50) (Mean ± S.D)	Group II (n=50) (Mean ± S.D)	p-Value
Age (Years)	43.46 ± 11.5	44.36 ± 10.5	0.81
Gender (%)			
Male	66%	60%	0.77
Female	34%	40%	
Etiology (%)			
2nd Layer Deep	40%	48%	0.85
Full Thickness	60%	52%	

The duration of the wound varied within both groups with varied regions been involved. The comparative analysis within the original wound size and decrease in it within the 4 weeks' time followed by 12 weeks' time presented significant variance with both procedures bringing sufficient minimizing in the size, however a slight better result was presented in group II in comparison with Group I (Table 2).

Table 2: Comparison within Reduction in Wound Size/Scar Quality within Group I and Group II

Wound Site	Wound Duration (Months)		Original Wound Size (cm^2)		Wound Size After 4 Weeks (cm^2)		Wound Size After 12 Weeks (cm^2)		p-Value
	Group I	Group II	Group I	Group II	Group I	Group II	Group I	Group II	
Right Forearm	5	6	14	11	8	7	5	4	0.032
Left Forearm	6	3	24	14	15	7	8	4	0.021
Right Leg	7	3	20	26	11	12	10	9	0.031
Left Leg	4	6	15	22	9	13	7	7	0.025
Right Arm	6	8	15	17	8	11	6	7	0.026
Left Arm	3	7	16	16	12	10	8	5	0.049
Right Hand	4	4	18	20	12	14	4	5	0.041
Right Knee	3	3	22	20	16	15	10	9	0.040
Right Foot	5	3	18	16	14	12	10	8	0.039

The healing time was also compared within both groups and it was interpreted through data that average healing rate was higher in group II than group I. In addition to this the healing rate was also significantly higher in the group II patients than group I patients (Table 3).

Table 3: Comparison of Healing Area per Day and Healing Time within Group I and Group II

Variables	Group I (PRP)	Group II (Fat Grafts)	p-Value
Wound Area (Mean ± S.D)	16 ± 3.8	19 ± 3.7	<0.05
Avg. Healing Area/Day (cm^2)	0.20	0.23	
Healing Rate (%)	56%	65%	

The histopathological slides presented more efficient healing in group II when compared with the group I at 4th week as is illustrated through figure 1. Efficient healing of group I; A-at first visit with several inflammatory cells-infiltrate the deep dermal layers (as revealed through the dotted line). B-at 4th week in Group I with a decrease in inflammatory cells subsequently post application of PRP. In group II; A-at first visit with several inflammatory cells-infiltrate the deep dermal layers (as revealed through the dotted line). C at the 4th week in Group II with a marked decrease in the inflammatory cells after application of emulsified fat. Resolution W/H: 518/554 Pixels Punch biopsy from the wound edge and bed in the 1st visit and in the 4th week after application of PRP (Group I) and after application of emulsified fat graft (Group II) was performed. The histopathological evaluation of the received specimens presented a reduction in the lymphocytic-infiltration within deep dermal layers, below the dotted line as present din Fig 1of group I and group II. However, a significant reduction was observed in group II when compared with group I. This indicated reduction in the lymphocyte-mediated chronic inflammatory response within both groups with more efficient result in group II at 4th week. Further reduction in the discharge, erythema as well as improvement in perilesional-skin quality with raised pliability were the salient features observed. Erythema was determined through the first 6-8 weeks of healing, then it started to decline by the 10th week till complete healing when it was very minimal but did not disappear completely. Skin pliability started to improve gradually, with yielding from the 5th week till the 10th week while further it became supple from the 10th week till complete healing attained. In the resent study the in-depth wound thickness was improved, it was decreased gradually from the beginning of

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the study till complete healing. Relating to VAS score in current study, it was initiated with a score of 6 in the 1st week, score of 4 in the 2nd week and a score of 2 in the 3rd week to the 7th week, then score 1 till complete healing in Group I. Whereas in Group II, it was started with a score of 6 in the 1st week, score of 3 in the 2nd week to the 6th week and a score of 1 in the 7th week to till complete healing.

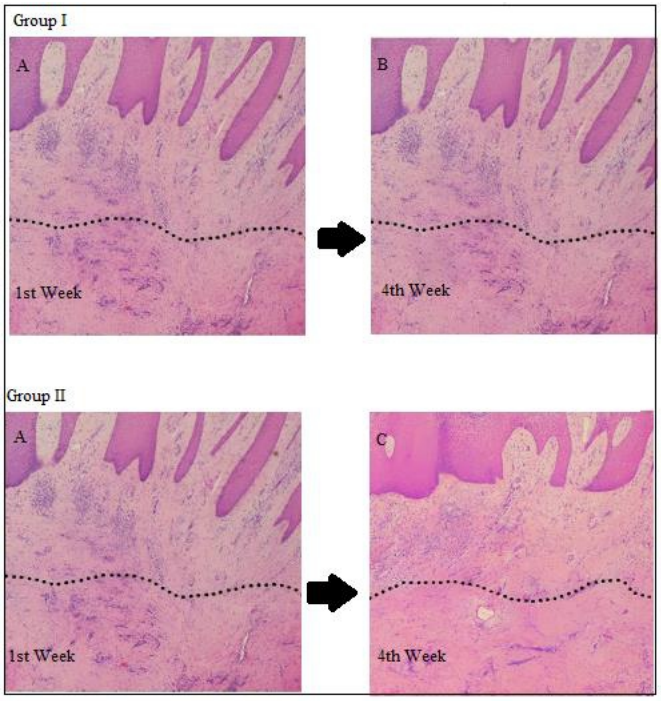

Figure 1: Comparative Histopathological Slides of Group I and II

DISCUSSION

The chronic wounds are a major challenge experienced by a surgeon. These wounds not only cause cost but have a high degree of morbidity related with them. A major identified cause of these wounds is the lack of growth hormone release. Traditional modalities do not apply the formation of the growth hormone resulting in the poor healing of the wounds. Within the late 80s the first PRP technique containing growth factors was used for healing of ulcerations. However, its use in post burn scars is still under establishment [18-20]. Majority of the cases which approach a hospital setting with post burn scars are male which get these scars through road traffic accidents. However, it is pertinent to note that the number of females having post burn scar is also not less evident. The mean age of the cases is between middle age group predicting young accidental or traumatic injuries leading to post burns. Similar results have been interpreted in various other literatures [20-23]. In the present study a comparative analysis within the fat graft and PRP technique was performed. The data collected presented that both of the techniques were giving reliable results. There was a reduction in the wound size within the first 4 weeks and continued up to 12 weeks in both groups. There are four different phases of wound healing which includes hemostasis; inflammation; proliferation; and remodelling [24]. The literature supports that fat graft as well as PRP have presented data where wound healing has been observed in cases with post burns [20-24]. In context of scar quality as well as healing time and rate although both of the techniques were giving efficient performance, however the present study as well as research elsewhere have highlighted the fact that fat graft is more efficient ion its performance and reduction of healing time with high healing rate. These results assisted in inkling the application of fat graft for the post burn scar treatments in cases especially with high thickness of wounds as was presented in the current study [23-25].

CONCLUSIONS

Application of platelet-rich plasma and fat graft both are efficient and reliable in reducing the scar quality and improving overall healing and reduction in burn scar. However, within the two groups the fat graft is more efficient and reliable with high healing time and rate.

Authors Contribution

Conceptualization: MN
Methodology: MA, HRA, MI, ALA
Formal analysis: MA, SF
Writing, review and editing: SI, HRA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Effectiveness of Balloon Tamponade with a Condom Catheter versus Using a Sengstaken-Blakemore Tube in Patients with Primary Postpartum Hemorrhage

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ABSTRACT

Balloon tamponade or Sengstaken-Blakemore tube, are gaining fame because of its low complications, low invasiveness, rapid approach, painless removal, and rapid identification of failed cases in primary postpartum hemorrhage. **Objective:** To compare the efficacy of balloon tamponade versus Sengstaken-Blakemore tube in patients with primary postpartum hemorrhage. **Methods:** This comparative/cross-sectional was conducted at the department of Obstetrics and Gynaecology at Bahawal Victoria Hospital, Bahawalpur from July 2023 to December 2023. A total of 64 patients (32 in each group) females aged between 18 and 40 years of parity 1-6, gravida 1-6, gestational age 31 to 41 weeks, with primary postpartum hemorrhage were recruited. Females in balloon tamponade group underwent balloon tamponade, and those in Sengstaken-Blakemore tube group underwent Sengstaken-Blakemore tube insertion and balloon removal after 24 hours. The effectiveness was labelled as yes where there was no blood loss for 24 hours after the removal of the pack or foleys. **Results:** The mean age was 31.05 ± 5.92 years. The effectiveness of the treatment was observed among 51 (79.7%) females. In balloon tamponade group, mean blood loss was 787.81 ± 265.11 ml and 791.34 ± 254.78 ml in Sengstaken-Blakemore tube group. In balloon tamponade group, 29 (90.6%) patients had effectiveness of treatment while 22 (68.8%) females in Sengstaken-Blakemore tube group reported effectiveness (p=0.030). **Conclusions:** Tamponade with a balloon attached to a condom catheter were more successfully in stop bleeding after delivery of primary PPH cases.

INTRODUCTION

A Postpartum Hemorrhage (PPH) is a condition characterized by the loss of more than 500 ml of blood after a vaginal birth or more than 1000 ml of blood after a cesarean delivery, accompanied by signs and symptoms of hemodynamic instability [1]. Around 5% of obstetrics patients may develop PPH, and 1% of vaginal births result in severe PPH, even if they are treated well [2]. PPH is the leading cause of maternal mortality in low-income countries, accounting for 150,000 fatalities per year, or 25% of maternal deaths globally [3]. Regional data describes 34% of maternal mortality attributable to PPH [4]. Local data reveals that PPH contributes to 27.2% maternal deaths [5]. While uterine atony is among the leading causes of primary PPH, it is estimated that 20% of patients have no identifiable risk factors. Consequently, the caregiver needs to maintain constant vigilance [6]. Anemia, fatigue, postpartum depression, acute stress reactions, dilutional coagulopathy, Sheehan's syndrome, transfusion reaction, infection, and occult myocardial infarction are some of the potential complications of PPH that can reduce quality of life and even lead to maternal mortality [7]. The Sengstaken-Blakemore tube, the Bakri balloon, the Rusch balloon, the Foley catheters, and the condom catheters are only a few of the balloon devices that have been used successfully to manage primary PPH [8]. Uterine balloon tamponade represents a new tool in the

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arsenal for the treatment of PPH. This is done prior to any invasive surgery. Uterine packing, or roller gauze, was once used to manage PPH. Uterine balloon tamponade has lately gained popularity as an alternative to roller gauze packs due to the latter's complexity and probable painful nature during insertion [9]. After medical managements failed, balloon catheter is probably the next logical option before resorting to surgical intervention and, potentially, a hysterectomy because it is the least invasive and the fastest technique. The benefits of this technique include the elimination of the need for a laparotomy, the quick and painless insertion with minimum anesthesia, the ability to have relatively untrained professionals do the procedure, and the prompt detection of failed instances [10]. A Sengstaken-Blakemore tube tamponade has been used in PPH, but the published data is scarce. To the best of our knowledge, not much data exists to assess the efficacy of balloon tamponade versus Sengstaken-Blakemore tube for treating PPH. A study found that when systematic administration of broad-spectrum antibiotics was done for preventative purposes in 88% of patients, the therapy with tamponade spared them from needing surgery, and in 71% of cases, the bleeding was brought under control [11]. The presence of an infection at the time of delivery is the one and only evident contraindication [11]. It was hypothesized that there is a difference in efficacy of balloon tamponade versus using Sengstaken-Blakemore tube in patients with PPH.

The current study was planned with the objective of comparing the efficacy of balloon tamponade with a condom catheter versus using a Sengstaken-Blakemore tube for the control of PPH among patients admitted to the Gynecology and Obstetrics Department Bahawal Victoria Hospital Bahawalpur.

METHODS

This comparative/cross-sectional study was carried out at the Gynecology and Obstetrics Department, Bahawal Victoria Hospital, Bahawalpur, Pakistan, from July 2023 to December 2023. The study had approval from the institutional ethical committee prior to its execution (Letter Number: 2363/DME/QAMC Bahawalpur, Dated: 15-03-2023). The sample size was calculated as 64 (32 in each group) by keeping the confidence level equal to 95% with 80% power and the anticipated prevalence of efficacy with balloon tamponade as 94.1% and with Sengstaken Blakemore tube as 68.2% [11]. Sample selection was made through simple random sampling approach. The inclusion criteria were females aged between 18-40 years of parity 1-6, gravida 1-6, gestational age 31 to 41 weeks, with primary PPH. The exclusion criteria were critically ill patients, those with documented end-organ liver or renal failure (assessed by a medical record), or those with a documented bleeding disorder history, i.e., factor deficiencies (assessed by a medical record). Those with secondary PPH, due to trauma or retained products of the placenta, or those with chorioamnitis were also excluded. PPH was labelled when more than 500 ml of blood was lost within 24 hours of vaginal birth or more than 1000 ml after cesarean delivery. The amount of blood lost during delivery was recorded by taking samples from a tray at the base of the table. The contents of the tray were dumped into a cylindrical plastic basin marked out in increments from 100 ml to one liter. Study participants or authorized guardians were asked for informed and written consent after we explained the objectives and safety aspects of this research. Data secrecy was also assured to all the study participants. At the time of enrollment, detailed clinical and demographic information was collected in the form of age, gravida, parity, duration of gestation at delivery, mode of delivery, previous uterine scar, position of the placenta, estimated blood loss and need for transfusion of blood products. Cases were divided into two equal groups by a simple lottery method. In balloon tamponade group, females underwent balloon tamponade, and those in Sengstaken-Blakemore group underwent Sengstaken-Blakemore tube insertion and balloon removal after 24 hours. Standard surgical procedures were adopted. The effectiveness was labelled as yes, where there was no blood loss for 24 hours after the removal of the pack or Foleys. Effectiveness was labelled as failed if there was more than 100 ml of blood loss within 10 minutes after the removal of the balloon tamponade or Sengstaken-Blakemore tube. A specifically predesigned proforma was created for data collection. The data were entered and analyzed through SPSS-26.0. Chi-square test was used to compare the two groups in terms of effectiveness and a p-value of <0.05 considered as significant.

RESULTS

In table 1, the mean age was 31.05 ± 5.92 years (ranging between 18-34 years. There were 36 (56.2%) females who were aged between 31-40 years of age. The mean gestation age was 37.43 ± 2.68 weeks, ranging between 31-41 weeks. Most of the females, 34 (53.1%) had gravidity >3. Parity status was ≤3 in 51 (79.7%) females. Mode of delivery was normal vaginal delivery in 37 (57.8%) females. Previous uterine scar was present in 17 (26.6%) females. In frequency distribution, various study characteristics among females of both study groups. Overall, effectiveness of the treatment was observed among 51 (79.7%) females. In balloon tamponade group, mean blood loss was 787.81 ± 265.11 ml and 791.34 ± 254.78 ml in Sengstaken-Blakemore tube group.

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Table 1: Distribution of the Study Characteristics in Both Groups (N=64)

Study Variables		Total N (%)	Balloon Tamponade (n=32) N (%)	Sengstaken-Blakemore Tube (n=32) N (%)	p-Value
Age (Years)	18-30	28 (43.8%)	15 (46.9%)	13 (40.6%)	0.614
	31-40	36 (56.2%)	17 (53.1%)	19 (59.4%)	
Gestational Age (Weeks)	31-36	22 (34.4%)	12 (37.5%)	10 (31.3%)	0.598
	37-41	42 (65.6%)	20 (62.5%)	22 (68.8%)	
Gravida	≤3	30 (46.9%)	17 (53.1%)	13 (40.6%)	0.316
	>3	34 (53.1%)	15 (46.9%)	19 (59.4%)	
Parity	≤3	51 (79.7%)	26 (81.3%)	25 (78.1%)	0.756
	>3	13 (20.3%)	6 (18.8%)	7 (21.9%)	
Mode of Delivery	Cesarean Section	27 (42.2%)	14 (43.8%)	13 (40.6%)	0.800
	Vaginal	37 (57.8%)	18 (56.3%)	19 (59.4%)	
Previous Uterine Scar	Yes	17 (26.6%)	9 (28.1%)	8 (25.0%)	0.777
	No	47 (73.4%)	23 (71.9%)	24 (75.0%)	
Blood Transfusion Required	Yes	15 (23.4%)	7 (21.9%)	8 (25.0%)	0.767
	No	49 (76.6%)	25 (78.1%)	24 (75.0%)	

In table 2, details about the stratification of various confounding factors were compared with respect to effectiveness in both study group, insignificant results were observed in all categories (p>0.05).

Table 2: Stratification of Effectiveness of Treatments between Two Groups According to Study Variables (N=64)

Study Variables		Effect-iveness	Total N (%)	Group-A (n=32) N (%)	Group-B (n=32) N (%)	p-Value
Age (Years)	18-30	Yes	20 (71.4%)	12 (80%)	8 (61.5%)	0.281
		No	8 (28.6%)	3 (20%)	5 (38.5%)	
	31-40	Yes	31 (86.1%)	17 (100%)	14 (73.7%)	0.053
		No	5 (13.9%)	-	5 (26.3%)	
Gestational Age (Weeks)	31-36	Yes	14 (63.6%)	10 (83.3%)	4 (40%)	0.055
		No	8 (36.4%)	2 (16.7%)	6 (60%)	
	37-41	Yes	37 (88.1%)	19 (95%)	18 (81.8%)	0.188
		No	5 (11.9%)	1 (5%)	4 (18.2%)	
Gravida	≤3	Yes	22 (73.3%)	14 (82.4%)	8 (61.5%)	0.201
		No	8 (26.7%)	3 (17.6%)	5 (38.5%)	
	>3	Yes	29 (85.3%)	15 (100%)	14 (73.7%)	0.051
		No	5 (14.7%)	-	5 (26.3%)	
Parity	≤3	Yes	42 (82.4%)	23 (88.5%)	19 (76%)	0.243
		No	9 (17.6%)	3 (11.5%)	6 (24%)	
	>3	Yes	9 (69.2%)	6 (100%)	3 (42.9%)	0.056
		No	4 (30.8%)	-	4 (57.1%)	
Mode of Delivery	Cesarean Section	Yes	20 (74.1%)	11 (78.6%)	9 (69.2%)	0.580
		No	7 (25.9%)	3 (21.4)	4 (30.8%)	
	Vaginal	Yes	31 (83.3%)	18 (100%)	13 (68.4%)	0.059
		No	6 (16.2%)	-	6 (31.6%)	
Previous Uterine Scar	Yes	Yes	11 (64.7%)	7 (77.8%)	4 (50%)	0.232
		No	6 (35.3%)	2 (22.2%)	4 (50%)	
	No	Yes	40 (85.1%)	22 (95.7%)	18 (75%)	0.057
		No	7 (14.9%)	1 (4.3%)	6 (25%)	
Blood Transfusion Required	Yes	Yes	9 (60%)	4 (57.1%)	5 (62.5%)	0.833
		No	6 (40%)	3 (42.9%)	3 (37.5%)	
	No	Yes	42 (85.7%)	25 (100%)	17 (70.8%)	0.054
		No	7 (14.3%)	-	7 (29.2%)	

In figure 1, balloon tamponade group, 29 (90.6%) patients had effectiveness of treatment while 22 (68.8%) females in Sengstaken-Blakemore tube group reported effectiveness (p=0.030).

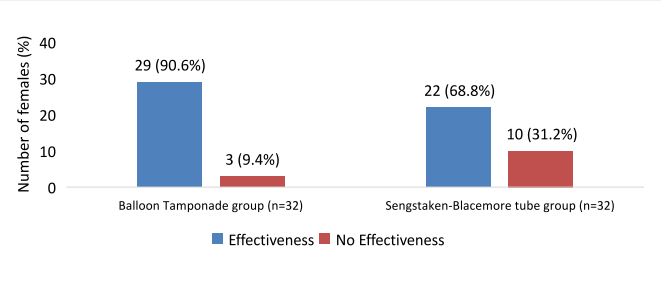

Figure 1: Effectiveness of Treatment in Both Study Groups (N=64)

DISCUSSION

In the present study, balloon tamponade group revealed effectiveness in 90.6% cases versus 68.8% cases in Sengstaken-Blakemore tube and the difference was statistically significant favoring balloon tamponade group (p=0.030). Dabelea *et al.*, utilized intrauterine balloon tamponade in 23 patients with PPH who did not respond to medical therapy, reporting a 100% success rate for cases attributed to uterine atony and an 80% success rate for bleeding associated with retained placenta [12]. Similarly, Kucukbas *et al.*, applied balloon tamponade in four PPH cases unresponsive to medical treatment, achieving successful hemostasis in all instances (one placental abruption, two cases of uterine atony, and one placenta previa)[13]. Another study treated 94 cases diagnosed with PPH who were unresponsive to medical therapy using balloon tamponade, resulting in an 84% success rate in achieving hemostasis for these patients. Another study provided that in 94% cases, condom catheter balloon stopped bleeding [14]. These findings exhibit that the balloon tamponade is an effective adjuvant in the treatment of severe PPH, particularly when the condition is

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caused by uterine atony and medicinal therapy is unsuccessful. A study done by Cho *et al.*, from Korea reported that Sengstaken-Blakemore tube was successful in 83.3% of PPH cases [15]. Sengstaken-Blakemore tube may be bent without breaking, and it is soft, non-traumatic consistency means that lengthy forceps are unnecessary for insertion. This makes implantation into the uterus safer by lowering the possibility of perforation. In contrast to using gauze as a tamponade, the failure of this approach to halt the bleeding is readily apparent. Sengstaken-Blakemore tubes are preferred once because they are disposable [16]. The use of a balloon catheter for postpartum bleeding is thought to be inappropriate in the presence of an infection contracted during delivery. A tamponade performed with a Sengstaken-Blakemore tube is not only easier to do but also less intrusive. It needs to be done before any surgical treatments are carried out. The World Health Organization (WHO), the American College of Obstetricians and Gynecologists (ACOG), and the Polish Gynecological Society have each established their own PPH treatment algorithms [17, 18]. Uterine balloon tamponade is a relatively new option for treating PPH, while The Bakri, Foley, Sengstaken-Blakemore, Rusch, and condom catheters are only a few examples of the many balloon options [19, 20]. Being a single center study conducted on a relatively small sample size were some of the limitations of this study.

CONCLUSIONS

Tamponade with a balloon attached to a condom catheter were more successfully in stop bleeding after delivery of primary PPH cases.

Authors Contribution

Conceptualization: SUN, MUR, NB
Methodology: SUN, AJ, NB
Formal analysis: AJ, MUR
Writing, review and editing: SUN, AJ, MUR, NB

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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Original Article

Impact of Pre-Operative Severity on Post-Operative Functional Outcomes in Patients with Cervical Myelopathy: A Comparative Analysis Using the Nurick Scale

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ABSTRACT

Cervical myelopathy pertains to the compression of the spinal cord in the neck region. The disease is debilitating in nature, and most cases require surgical intervention to avoid further nerve interference. However, the ability of preoperative myelopathy classification to accurately predict superlative postoperative outcomes remains unknown. **Objective:** To assess the functional outcomes following surgery in patients diagnosed with cervical myelopathy while considering their preoperative Nurick grade. **Methods:** A retrospective cohort study was conducted on a cohort of 80 patients diagnosed with cervical myelopathy that underwent surgical intervention in the hospital. The study reviewed and analyzed the demographic data and recorded the type of surgery among other factors such as follow-up duration. Statistical analysis was conducted using SPSS version 26.0 and a comparative test for correlation with respect to pre and post-surgery Nurick grades was done using cross-tabulation. **Results:** Among 38.75% of cases, surgery was performed on the anterior. A notable improvement in the post-surgery Nurick grade was observed with significant improvement noted in patients with higher preoperative classification. The results had a profound correlation between the two grades before and after surgery as analyzed statistically having a p-value of 0.00. **Conclusions:** Surgical treatments have proven to be quite effective in improving functional outcomes for individuals diagnosed with cervical myelopathy. Patients who had less severe or milder neurological deficits before the surgery experienced the most significant improvement after the procedure. These findings emphasize the significance of preoperative assessment in predicting postoperative outcomes and guiding treatment decisions.

INTRODUCTION

The most common spinal cord disorder in adults is cervical myelopathy, a condition of nontraumatic degeneration. The disease develops when the cervical spinal canal narrows as a result of progressive arthritic/spondylotic disorders and somewhat compresses the spinal cord, causing gradual disability [1]. The perfect time for the management of CSM is still a matter of contention due to the unpredictable nature of the condition. There is a possibility of developing a progressive course of the disease with an increasing level of disability or the disease process may be quiescent. It has previously been believed that surgical decompression stops the progression of myelopathic symptoms but does not improve neurological function. However, recent studies have demonstrated that decompression in the case of CSM leads to an improvement in the patient's functional status and quality of life [2-4]. Recent meta-analysis has shown that the prevalence of asymptomatic spinal cord compression is 24.2% and the prevalence of DCM is 2.3% within geriatric populations. The prevalence of DCM is even higher among the >60 years 35.3% and the ≤60 years 7.4% [5]. Furthermore, this correlates with the circumstantial evidence, pointing to the fact that DCM is the most common cause of spinal cord injury on a global scale, and develops with age [6, 7]. The only method capable of modifying the development of the condition when applied is surgical decompression. It became particularly popular in the last two decades due to the aging of the population [8]. The degree of disease

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severity can be classified and assessed by various systems. The oldest and most widely used classification system is the Nurick classification for myelopathy, instigated in 1972. The classification presents an important tool for disease severity assessment and grading, which is essential for making clinical decisions. In the Nurick classification, patients are subdivided by rank of severity, with Grade 0= asymptomatic, Grade 4= walk with aid, and Grade 5= bedridden [9]. Previous studies have assessed patients' surgical outcomes concerning cervical myelopathy. However, only a few reports have evaluated the status of recovery of cervical myelopathy patients considering the pre-operative Nurick grade. For example, Fehlings and colleagues conducted a prospective study on surgery treatment effects on patients showcasing the classification of myelopathy severity. The study results showed significant improvement in patients across mild to severe disease categories at a 1-year follow-up period [14]. However, these observations point out the need to disaggregate the pre-operative myelopathy classification as it relates to predicting the postoperative outcomes. It is vital to understand how a patient's preoperative condition severity influences postoperative recovery and outcomes. The rationale of the study is to determine if the first preoperative Nurick grade may predict postoperative results by investigating variables that may contribute to functional recovery, pain reduction, and neurological improvement after surgery. The findings of this research may give doctors fresh information on what to anticipate in terms of progression and function restoration after cervical myelopathy surgery, depending on the patient's initial severity.

The goal of the study was to look at the functional results following surgery for cervical myelopathy patients with Nurick Grades 1-2 and 3-4.

METHODS

The study was conducted in a public hospital situated in Rawalpindi City, Pakistan, and the cohort design was used for retrospective research. The sample of the research included patients who had been diagnosed with CSM and underwent surgery in the coosen hospital from 1st Feb 2023 to 29th Feb 2024. This is the patient group, those of whom had follow-up in the outpatient in the department. The research protocol was approved and certified by the ERC of Riphah International University on 22 Dec 2023 under Ref No: 555-AAA-ERC-R2R . Current study focused on patients who must meet the criteria to be enrolled in the study. Such diagnostic criteria consisted of clinical and MRI evidence of disease, a cornage of C3 to C7, and the age range of 20 to 80 years. We did not include those patients, whose medical records were incomplete or missing, people who were operated on in another hospital, or those who suffered myelopathy because of vascular or connective tissue disorder/infection/trauma/birth defect/untold reasons. Besides excluding individuals whose myelopathy was created as a result of the ossification of the ligamentum longitudinal posterius, or fluorosis, we also excluded certain people. Personal information such as name, age, and gender; and medical history along with diagnosis yielded from the hospital record served as the basis for data collection in every one of the participants. These were the functional impairment levels that were evaluated by medical records reviewing the Nurick grades before and after the surgical intervention. Outcome evaluation was done using the Nurick scale at the end of the follow-up and assessment periods [9]. The statistical analyses were performed using SPSS version 26.0 for Windows. We summarized the categorical variables using frequencies and percentages, and the continuous variables were expressed as means and standard deviations. Chi-square and cross-tabulation analyses were used to compare the functional outcomes before and after surgery.

RESULTS

In the study cohort comprising 80 patients, 32 (40%) were male and 48 (60%) were female. Regarding age distribution, 11 patients (13.75%) were less than 50 years old, 48 (60%) were aged between 50 and 60 years, 13 (25%) fell within the 60 to 80 years age group, and 8 (10%) were above 80 years old. The mean age of the sample was 56.31 ± 8.2 years (Table1).

Table 1: Sociodemographic Characteristics

Variables	N (%)
Gender	
Male	32 (40%)
Female	48 (60%)
Age (Years)	
Less Than 50 Years	11 (13.75%)
50 - 60 Years	48 (60%)
60 - 80 Years	13 (25%)
Above 80 Years	8 (10%)

In the study cohort of 80 patients, 31 (38.75%) underwent anterior surgery, 37 (46.25%) opted for posterior surgery, and 12 (15%) underwent a combined approach. Follow-up durations varied, with 58 patients (72.5%) followed for less than 6 months, 16 (20%) for 6-12 months, and 6 (7.5%) for more than a year (Table 2).

Table 2: Clinical Characteristics of the Study Sample

Variables	N (%)
H/O DMM and HTN	
Yes	68 (85%)
No	12 (15%)

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Surgical Approach	
Anterior	31 (38.75%)
Posterior	37 (46.25%)
Combined	12 (15%)
Follow Up Duration	
Less Than 6 Months	58 (72.5%)
6 - 12 Months	16 (20%)
More Than Year	6 (7.5%)

Pre and Post-Operative Nurick scale

The comparison between pre-operative and post-operative Nurick grades revealed notable findings. Among patients initially classified as Nurick Grade 1 or 2, the pre-operative cohort comprised 29 individuals, which increased to 31 post-operatively. The associated p-value for this comparison was 0.06, suggesting no statistically significant difference between the pre-operative and post-operative grades at the conventional significance level of 0.05. Conversely, in patients with pre-operative Nurick Grade ≥ 3, consisting of 51 individuals pre-operatively, the post-operative count decreased to 49. Here, the p-value was calculated to be 0.04, indicating a statistically significant difference between the pre-operative and post-operative grades at the 0.05 significance level. These findings underscore the influence of pre-operative severity on post-operative outcomes, with a significant improvement observed in patients initially classified as Nurick Grade ≥ 3 (Table 3).

Table 3: Contingency Table of Pre-and Post-Operative Nurick Scale

Nurick Grade	Pre-Operative	Post-Operative	p-Value
Nurick Grade 1 or 2	29	31	0.06
Nurick Grade ≥ 3	51	49	
p-Value	**0.04***		

*= P<0.05

The cross-tabulation between pre-operative and post-operative Nurick grades delineated significant patterns in functional outcomes for patients undergoing surgical intervention for cervical myelopathy. Among those with a pre-operative Nurick grade of II, a substantial majority (93.5%) attained a post-operative grade of I, signifying marked improvement, while only a minority (6.5%) remained in the same grade post-operatively. Patients with a pre-operative grade of III displayed a varied distribution in post-operative outcomes, with 50% retaining their pre-operative grade and the remaining 50% advancing to grade II post-operatively. Notably, individuals with a pre-operative grade of IV experienced notable progress, as 60% reached a post-operative grade of IV and 28% improved to grade III. Conversely, patients with a pre-operative grade of V demonstrated remarkable enhancement, with all cases (100%) achieving a lower post-operative grade (IV). The statistical analysis underscored a significant association between pre-operative and post-operative grades (p-value = 0.00), emphasizing the influence of pre-operative status on postoperative outcomes (Table 4).

Table 4: Detailed Cross-Tabulation of Pre-and Post-Operative Nurick Scale

Grade	Post-Operative Nurick Grade						p-Value
	I	II	III	IV	V	Total	
II	29	2	0	0	0	31	**0.00***
III	0	9	9	0	0	18	
IV	0	0	7	15	3	25	
V	0	0	0	0	6	6	
Total	29	11	16	15	9	80	

*= P<0.05

DISCUSSION

The findings of the present study regarding pre and post-operative Nurick scale grades align with previous research, corroborating the notion that surgical intervention significantly improves functional outcomes in patients with cervical myelopathy. The observed shift towards lower post-operative Nurick grades among patients with higher pre-operative grades underscores the effectiveness of surgical management in mitigating neurological deficits. This is consistent with the findings of Morio *et al.*, and Curick *et al.*, who reported substantial neurological improvement post-surgery [15, 16]. Cervical myelopathy is prevalent among the elderly population, typically affecting individuals over 40 years of age. In this study, data from 80 cases of cervical myelopathy undergoing surgical decompression and fusion were analyzed, with the majority of patients falling within the 50 to 60-year age range. The increased incidence of cervical myelopathy in middle-aged individuals may be attributed to lifestyle modifications. Consistent with current study findings, Abraham *et al.*, and Zhang *et al.*, also reported a higher prevalence of CSM among individuals aged 40 to 60 years [17, 18]. The treatment of CSM remains a subject of ongoing debate, largely due to the limited understanding of its natural progression [19, 20]. Nonetheless, existing literature suggests a consensus regarding the notion that a briefer duration of symptoms and less severe neurological impairment before surgery are associated with improved postoperative outcomes [21]. According to Hirai *et al.*, surgical interventions have been identified as effective measures in halting the progression of the disease. These interventions typically involve either anterior or posterior approaches. Their study demonstrated a noteworthy 85% improvement in neurological status among patients, accompanied by a reduction in the mean Nurick [22]. Morio *et al.*, reported neurological improvement in over 70% of patients, whereas Clarke *et al.*, observed neurological improvement in 85% of their patient cohort [15, 16].

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Additionally, Wilberg *et al.*, conducted a study involving 99 cases of CSM and found that 80% of patients experienced neurological improvement post-surgery, with a remarkable 95% prevention of myelopathy progression [23]. The severity of preoperative symptoms in patients with cervical myelopathy has a significant impact on their functional outcomes after surgery. Research has indicated that various factors, such as the curvature of the spine before surgery, the length of time symptoms have been present, the preoperative mJOA scale, the presence of certain MRI signal intensities, and changes in the Cervical Sagittal Vertical Axis (cSVA), can all influence the recovery process [24-26]. Patients with myelopathy who undergo Anterior Cervical Discectomy and Fusion (ACDF) tend to experience less favorable outcomes compared to non-myelopathic patients. They could be at a higher risk of needing further surgical procedures and hospital readmissions [27]. A limitation of present study was that, although the levels of implants used were similar across all groups, we did not collect information on the specific components used in individual cases. A growing body of research indicates that certain low-profile implants might significantly influence patient outcomes more than previously believed. Not having a control group is another potential constraint; nevertheless, we aimed to conduct a direct comparison among individuals diagnosed with CSM based on symptom severity rather than against healthy individuals. Fehlings *et al.*, have even suggested that the inclusion of patients who may deteriorate and require surgery could introduce confounding factors into prospective studies involving CSM patients when control groups are employed [14].

CONCLUSIONS

The current evidence examining the correlation between the severity of cervical myelopathy before surgery and patient-reported outcomes after surgery serves as the foundation for the present investigation. At present, a universally accepted approach regarding the management of benign myelopathy is lacking; however, surgical intervention is advised for patients afflicted with moderate-to-severe disease. It is noteworthy that 93.5% of patients who had a pre-operative Nurick grade of II achieved a lower grade of I post-operatively, demonstrating remarkable improvement. Nevertheless, a significant proportion of patients who had pre-operative grades III, IV, and V demonstrated discernible patterns of improvement, culminating in lower grades after the procedure. The statistical analysis revealed a statistically significant correlation (p-Value = 0.00) between the grades before and after the operation, indicating that the pre-operative condition significantly affects the outcomes after the procedure. These results show how surgical intervention might enhance functional results for cervical myelopathy patients, especially those with less severe neurological impairments before surgery.

Authors Contribution

Conceptualization: MS
Methodology: MS, WBS
Formal analysis: SAQ, SI, WA
Writing, review and editing: AUM

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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