



Original Article

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

Salman Zahir¹, Khansa Khan², Noor Sardar³, Sarwat Jahan⁴, Muhammad Mehr Ali², Aamir Khan², Janeeta Khattak²,
Somia Mazhar⁵ and Jamal Shah²

¹Department of Medicine and Surgery, Northwest General Hospital and Research Center, Peshawar, Pakistan

²Department of Medicine and Surgery, Northwest School of Medicine, Peshawar, Pakistan

³Department of General Surgery, Northwest General Hospital and Research Center, Peshawar, Pakistan

⁴Department of Pharmacology, Northwest School of Medicine, Peshawar, Pakistan

⁵Department of Biomedical Sciences, National University of Science and Technology, Islamabad, Pakistan

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*Corresponding Author:

Salman Zahir

Department of Medicine and Surgery, Northwest General Hospital and Research Center, Peshawar, Pakistan

salmanzahir01@gmail.com

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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^o 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

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 at 5 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

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	χ 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

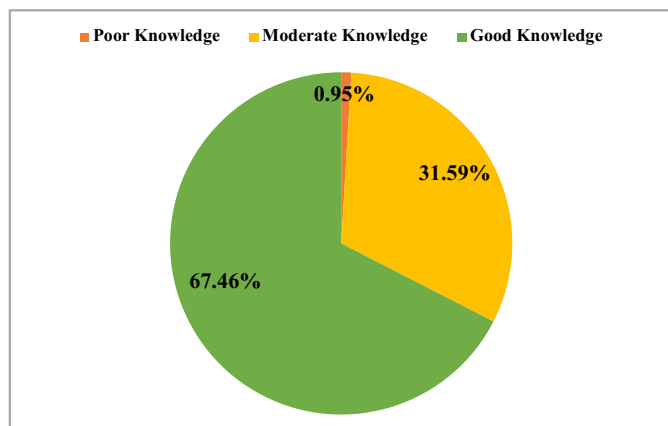


Figure 1: Total Knowledge of the Healthcare Workers about Standard Precautions

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	χ^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.

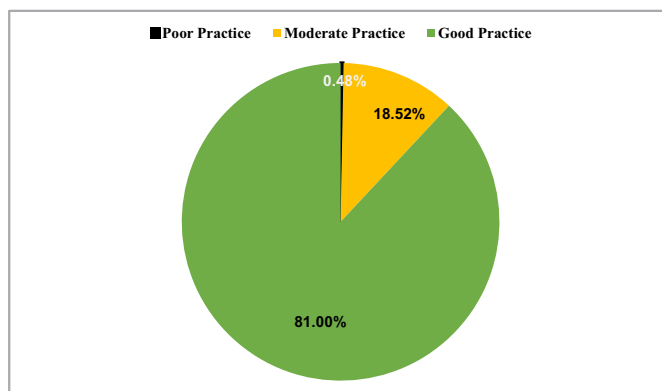


Figure 2: Adherence to Standard Precautions by Healthcare Professions

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

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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