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Association between Temporomandibular Joint dysfunction and Stress in Undergraduate BDS Students of Rawalpindi/Islamabad

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ABSTRACT

Temporomandibular Joint Dysfunction (TMJD) is a condition linked with psychological factors like stress. Dental students experience high academic stress which makes them an ideal candidate to investigate the relationship between TMJD and stress. **Objective:** To investigate the association between TMJD and stress in undergraduate BDS students in Rawalpindi and Islamabad. **Methods:** A cross-sectional study was conducted among 346 BDS students using convenience sampling. Participants completed structured questionnaires, including Fonseca's Anamnestic Index for TMJD and the Perceived Stress Scale. Data analysis was performed using SPSS version 21.0, employing chi-square tests for categorical data and correlation analysis for continuous variables. he study was conducted in two dental institutes namely Margalla Institute of Health Sciences and Foundation University College of Dentistry and Hospital. **Results:** Out of 346 participants, 264 (76.30%) were females and 82 (23.70%) were males, with a mean age of approximately 20.7 years. The result of the chi-square test for the association between gender and TMJD was a statistically significant relationship ($p = 0.00033$), with females showing higher rates of mild and moderate TMJD compared to males, whereas the chi-square test for the association between the year of study and TMJD also indicated a significant relationship ($p = 0.023$). **Conclusions:** This study found a significant association between stress and Temporomandibular Joint Dysfunction (TMJD) among undergraduate BDS students.

INTRODUCTION

TMJD affects quality of life, especially in chronic cases. Painful TMJD can deprive an individual of the basic oral functionality, thereby, contributing to psychological distress. Even non-painful TMJD's can decrease oral comfort and function [1]. The study investigates the association of TMJD and stress among the undergraduate dental students in Rawalpindi and Islamabad. Despite available research on the TMJD and stress, a very limited number of studies are available among dental students who are subject to high emotional and academic stress. This gap in the literature highlights the need for targeted research in this demographic. Despite the well-documented association between perceived stress and TMJD, there is a significant lack of research focusing on dental students, who are known to experience elevated stress levels due to the demanding nature of their academic and clinical training. Additionally, while previous studies have identified gender as a factor associated with TMJD, this relationship remains underexplored in the context of academic environments, particularly among dental students. Temporomandibular Joint Dysfunction (TMJD) refers to a group of neuromuscular and musculoskeletal disorders characterized by issues in the structures surrounding the Temporomandibular Joint (TMJ), primarily affecting the muscles of mastication [2]. Perceived stress, on the other hand, is defined as the

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degree to which an individual feels overwhelmed or unable to cope with stressors over a specific period of time [3]. The term Temporomandibular Joint Disorder (TMJD) implies problems in the TMJ, muscles of mastication, or structures associated with them [4]. TMJD covers a range of conditions, be it musculoskeletal or neuromuscular. The etiology of a painful TMJD varies from person to person and is a matter of debate. However, it is known to be in line with the biopsychosocial model of illness [5]. It implies the fact that a person's psychological and social profile contributes to the development of a "biological disease" it's not mandatory for a TMJD to be symptomatic [6]. TMJ disorders like temporomandibular joint osteoarthritis are asymptomatic [7]. TMJD includes a wide variety of disorders. These disorders can be developmental like condylar aplasia, hyperplasia etc. or they can be traumatic disorders like fractures, dislocation, or subluxation of the joint. Developmental, degenerative and benign neoplasms are also disorders of Tumor lesions of the TMJ including primary synovial chondromatosis, TMJ calcium pyrophosphate dihydrate deposition disease, simple bone cyst and aneurysmal bone cyst [8]. Early suspicion of TMJD can lead to a better prognosis, a better quality of life and can reduce the economic healthcare burden. Signs and symptoms of TMJD vary from person to person and there is no set diagnostic criteria [9]. A prevalence study on TMJD shows that 31% of the elderly population and 11% of youngsters have a disorder of TMJ [10]. Another study done in the city of Karachi showed the prevalence of TMJD to be 66.6% among young adults – when done through the Fonseca questionnaire [11]. Similar prevalence studies have shown the percentage to be 9.4%, 60%, and 60.50% among young adults [12-14]. The dental school presents a challenging and intense atmosphere for students, recognized for its significant stress levels. The dental profession has evolved into a demanding and competitive field. Dental students must navigate rigorous academic studies, demanding clinical responsibilities, and the need for strong interpersonal abilities. Studies suggest that a considerable percentage of patients with Temporomandibular Joint (TMJ) disorders have experienced stressful life events before the onset of symptoms [15].

The aim and objective of this study was to investigate the association between Temporomandibular joint and stress in undergraduate BDS students living in Rawalpindi and Islamabad.

METHODS

A cross-sectional study was conducted in the dental institutes of Rawalpindi and Islamabad, after getting approval from the institutional review board of Margalla Institute of Health Sciences ERC Ref No: DS/234/24.The duration of the study was from 29-05-2024 to 10-07-2024. Data were collected from Foundation University Dental Hospital, Margalla Institute of Health Sciences, and Islamabad Medical and Dental College. Consent was obtained from the participants, in the start of questionnaire. The sample size was calculated assuming a 95% confidence level, 5% margin of error, and 50% population proportion, as no prior prevalence data were available for TMJ dysfunction among undergraduate BDS students in Rawalpindi and Islamabad. The 50% proportion was chosen to maximize the sample size, ensuring adequate statistical power to detect significant associations. Based on these parameters, the calculated sample size for an infinite population was 385. However, the study included 346 participants, which is slightly lower than the recommended 385. This may slightly affect the statistical power of the study. Nevertheless, if the population size is relatively small, a finite population correction could adjust the required sample size downward, making 346 participants a reasonable and practical sample size for this study. After obtaining informed consent from the students of BDS, a total of 346 participants were included in the study using convenience sampling technique (non-probability sampling). The inclusion criteria of the study were all the participants enrolled in the discipline of BDS, willing to participate in the study and with no prior history of mental illness. All the participants who had a history of trauma or surgery to the maxillofacial region were excluded. In addition, participants with a history of some form of connective tissue disorder were also excluded. Data were collected as a structured questionnaire via google forms. After the questions of demographics and the inclusion and exclusion criteria; two open access questionnaires were added with 10 items each. The first questionnaire was meant to evaluate the presence or absence of severity of a TMJ disorder Fonseca's Anamnestic Index (FAI) [15]. An answer of "yes" meant 10 points, "no" meant 0 and "sometimes" meant 5 points. A total was done of all the points of FAI and the total score decided the likelihood of a TMJ disorder as to whether it was absent (0-15), mild (20-40), moderate (45-65), or severe (70-100). The second questionnaire was meant to measure the perceived stress of an individual's life Perceived Stress Scale (PSS) [16]. Each question was allocated a number which was as follows; 0-never, 1-almost never, 2-sometimes, 3-fairly often, and 4-very often. Before totaling the scores the numbers for question 4, 5, 7, and 8 were reversed in the following way; 0=4, 1=3, 2=2, 3=1, and 4=0. After summing up the total, the final score decided the perceived stress to be low, moderate or high. Data were entered and analyzed in Statistical Package for Social Sciences (SPSS) version 21.0. For quantitative variables, mean and standard deviation was computed. For qualitative variables, frequencies and percentages were computed.

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RESULTS

The study included 346 participants, with 264 females (76.30%) and 82 males (23.70%). The mean age of the participants was approximately 20.7 years. The overall prevalence of TMJ dysfunction was high, with 64% (n = 169/264) of females and 42% (n = 34/82) of males reporting mild to moderate TMJ dysfunction. The distribution of TMJ dysfunction by gender is presented in Table 1.

Table 1: Gender Distribution and TMJ Dysfunction

Gender	Absent Frequency (%)	Mild Frequency (%)	Moderate Frequency (%)	Severe Frequency (%)
Female	94 (35.61%)	115 (43.56%)	42 (15.91%)	13 (4.92%)
Male	47 (57.32%)	32 (39.02%)	2 (2.44%)	1 (1.22%)

Stress Levels and TMJ Dysfunction was a significant relationship was observed between stress levels and TMJ dysfunction ($p = 2.94 \times 10^{-8}$). Participants with higher perceived stress levels exhibited higher rates of TMJ dysfunction. The distribution of TMJ dysfunction across different stress levels is presented in Table 2.

Table 2: Stress Levels and TMJ Dysfunction

Stress Level	Absent Frequency (%)	Mild Frequency (%)	Moderate Frequency (%)	Severe Frequency (%)
High Perceived Stress	3 (8.11%)	17 (45.95%)	12 (32.43%)	5 (13.51%)
Low Stress	39 (65.00%)	17 (28.33%)	4 (6.67%)	0 (0.00%)
Moderate Stress	99 (39.76%)	113 (45.38%)	28 (11.24%)	9 (3.61%)

Correlation analysis indicated a strong positive correlation between PSS score and stress level (r = 0.856), and a moderate positive correlation between PSS score and FAI scores (r = 0.446). Additionally, a moderate positive correlation (r = 0.446) was observed between PSS and Fonseca's Anamnestic Index (FAI) scores, indicating that while stress is a significant factor in TMJD, other factors such as occlusal interferences, bruxism, and musculoskeletal disorders may also contribute.

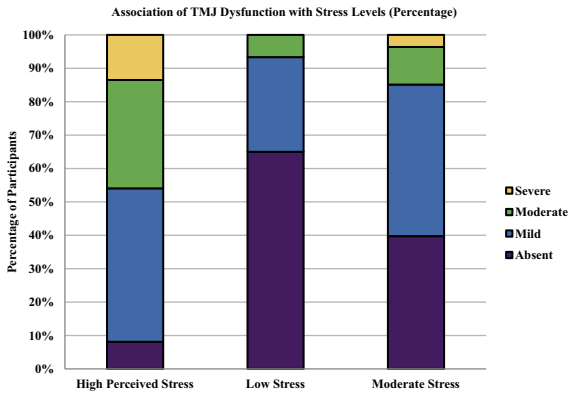

Figure 1: Association of TMJ Dysfunction with Stress Level

DISCUSSION

Temporomandibular Joint Dysfunction (TMJD) encompasses a variety of disorders affecting the jaw joint and surrounding muscles, often leading to pain and impaired movement. Stress, a known exacerbating factor for TMJD, has been widely studied for its role in triggering and worsening these conditions. The high prevalence of TMJ dysfunction observed in this study (64% in females and 42% in males) aligns with findings from similar populations in Pakistan and other regions. For instance, a study in Karachi reported a TMJD prevalence of 66.6% among young adults while another study among dental house officers in Pakistan found a prevalence of 60% [17, 18]. These high rates may be attributed to the intense academic and clinical demands of dental education, which contribute to elevated stress levels. Stress is known to exacerbate TMJD symptoms through mechanisms such as bruxism and muscle tension. The findings of this study align with existing literature suggesting a significant association between psychological stress and Temporomandibular Joint Dysfunction (TMJD) among young adults. Studies from Pakistan corroborate that stress is a major contributing factor to TMJD. For instance, a study conducted in Karachi among young adults found that 66.6% of participants exhibited TMJD symptoms, as measured by Fonseca's Anamnestic Index (FAI), highlighting the prevalence of TMJD under high-stress conditions in similar populations [19]. Another study among dental house officers reported a TMJD prevalence of around 60%, also emphasizing the role of biopsychosocial factors like stress and mental well-being in TMJD development [20]. Temporomandibular Joint Disorders (TMJD) are a group of disorders that encompass jaw muscles, masticatory muscles, and the associated nerves. Clicking of TMJ, pain or tenderness in the jaw, difficulties in jaw movements etc. are few symptoms associated with TMJD. The cause of TMJD is not defined and can be unknown [19]. However, it is thought to be associated with higher levels of depression, anxiety, and stress which adds up to psychological distress [21]. Adding to this concept, a study was conducted in the 3 major cities of Pakistan that discussed the association between temporomandibular disorders and biopsychosocial factors. It confirmed that psychosocial stress is directly related to TMDs [22]. Similarly, the current study demonstrates a significant relationship between stress levels and TMJD in undergraduate BDS students in Rawalpindi and Islamabad. This association is consistent with existing literature, which has repeatedly shown that psychological stress is a key factor in the development and exacerbation of TMJD symptoms. Similar results were shown in another study on Turkish dental students [23]. Stress is thought to induce tension in the muscles and that

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in-turn leads to TMJD pain. In addition, it is also believed that TMJD pain can lead to stress, i.e. the two variables have a reciprocal relationship between them [24]. Psychological factors like anxiety and stress contribute to bruxism which is proven to be directly associated with TMJD [25]. Moreover, studies have also shown there is a possible association between TMJDs and hormones like progesterone and estrogen. Understanding of TMD's should be enlightened by arranging seminars and promoting TMD education. With that dental students should be encouraged to know their stress-triggers. Once that's achieved; stress relaxation techniques, like deep-breathing, meditation, muscle relaxation, good diet, exercise, and sleep hygiene should be promoted.

CONCLUSIONS

This study finds a significant association between stress and Temporomandibular Joint Dysfunction (TMJD) among undergraduate BDS students. Higher stress levels were linked to increased TMJD severity, reinforcing the role of psychological factors in the condition. These findings highlight the need for stress management interventions to mitigate TMJD risk in this population.

Authors Contribution

Conceptualization: SK
Methodology: AHR, AAM, SN, AK
Formal analysis: NB
Writing, review and editing: SK, NB, AHR

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

Conflicts of Interest

All the authors declare no conflict of interest.

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