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Prevalence of Temporomandibular Joint Pain Associated with Stress among Medical Undergraduate University Students in Karachi: A Cross Sectional Study

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ABSTRACT

Temporomandibular disorders (TMDs) are complex musculoskeletal conditions that impact the TMJ, marked by discomfort, limited movement, and audible sounds from the joint. Psychological stress has been identified as a key factor contributing to the onset and worsening of TMD. University students, especially those enrolled in medical programs, face heightened levels of stress from academic and social demands, making them particularly susceptible to stress-related musculoskeletal issues.To assess the prevalence of Temporomandibular joint pain among undergraduate medical students at universities in Karachi and to examine its association with perceived stress levelA cross-sectional study was conducted among 374 medical undergraduate students from various universities across Karachi, selected through non-probability convenience sampling. Data were collected using validated instruments: Fonesca Amnestic index (FAI) for assessing TMD severity and Perceived stress Scale (PSS-10) for evaluating stress level. Descriptive statistics were used to determine the rates of prevalence, whereas chi square and Fisher's exact tests were applied to assess the association between stress severity and TMD severity.A total of 374 undergraduate health sciences students (66.3% females; mean age 22.08 ± 1.88 years) were included. Based on the Fonseca Anamnestic Index, 75.7% exhibited some degree of TMD, predominantly mild (38.8%), with frequent headaches (51.1%) and neck pain (42.5%) being common symptoms. The mean perceived stress score was 20.30 ± 5.79, with 74.9% reporting moderate stress. TMD severity showed significant associations with gender, year of study, educational program, and perceived stress severity ($p < 0.05$), while age was not significantly associated. This study reveals a significant prevalence of temporomandibular disorders among undergraduate students in health sciences, with stress contributing significantly to the severity of the condition. Female students, those in their later years of study, and individuals with a higher perception of stress showed greater susceptibility, while age did not seem to impact the severity of TMD. These results underscore the importance of implementing early detection methods, stress management programs, and preventive measures within educational environments to reduce the advancement and effects of TMD.

Keywords: *Temporomandibular joint, Temporomandibular Joint Dysfunction Syndrome, Temporomandibular disorders, Psychological stress, Medical students.*

INTRODUCTION

The temporomandibular joint (TMJ) is formed by the connection between the mandible and the temporal bone of the skull. It is located on the lateral part of the face, just in front of and to the side of the tragus of the ear.[1] The joint has a fibrous structure known as an articular disc, which facilitates movements of the mandible, including depression, elevation, lateral deviation, retrusion, and protrusion. Surrounding the joint are various soft tissue components, including muscles and ligaments.[2]Mastication and communication are two essential functions of the temporomandibular joint (TMJ). The stability of the TMJ is affected by the muscles located in the head, face, and cervical spine. From an anatomical perspective, the temporomandibular joint comprises two primary components: the TMJ itself and the neuromuscular system; however, there is also a third functional component that is not ossified, known as the articular disc, which facilitates joint movement. When the tissue is under tension, connections to the adjacent ligaments and muscles ensure that the disc and condyle move together beneath the temporal bone. Any disruption to the normal function of this complex system can result in temporomandibular disorders.[3]TMD is a condition influenced by multiple factors, with various elements contributing to the onset, advancement, and worsening of symptoms. Individuals with TMD might exhibit myofascial discomfort, structural alterations in the condyle, displacement of the disc, or issues related to disc derangement.[4] Temporomandibular disorders (TMDs) are identified by limited jaw movements, joint pain from inflammation, as well as symptoms like locking, clicking, and dislocation of the temporomandibular joint (TMJ) during chewing.[5] TMJ noises and shifts or constraints in the movement range of the jaw can occur during jaw functions. TMD typically manifests as widespread discomfort in the head and neck area, especially affecting the masticatory muscles. The pain tends to be more severe in the morning, and there is frequently a background of stressful experiences, trouble sleeping, and bruxism.[6]

TMJ dysfunction is the second most common reason for orofacial pain, following dental issues. TMJ disorders and problems in the cervical region significantly impact daily activities and lifestyle, reducing an individual's capacity to engage socially and work autonomously.[7]

Moreover, the discomfort and various symptoms linked to TMD result from factors beyond just the histopathology of the joint and its adjacent structures. Pain associated with TMD may stem from changes in nociceptive processing (involving inflammatory cytokines and reactive oxygen species) in the trigeminal ganglia (TG) and the spinal trigeminal nucleus (Sp5C).[8] Orofacial pain is regarded as one of the primary contributors to TMD, which can be relieved by relaxing the joints. However, certain psychological influences, including stress and oral parafunctional habits, can worsen the pain.[9] Currently, the bio-psychosocial model is regarded as the most widely accepted framework for understanding the complexities of TMD . As our comprehension of TMD grows, it is now viewed as a manifestation of central sensitization syndrome (CSS), which is characterized by persistent pain. The idea of CSS is centered around the concept of central sensitization (CS), involving structural changes in neurons at higher levels that lead to alterations in their function. These groups of hyper excitable neurons primarily enhance the pain response through various mechanisms, thereby impacting pain behaviors. Initially, these changes are thought to originate from peripheral injury or dysfunction; however, once the area of CS is established, it becomes self-sustaining, explaining the spontaneous, exaggerated, and chronic characteristics of TMD pain. Over time, in the process of chronic pain development, additional factors such as the autonomic nervous system, endocrine influences, descending pathways, and cognitive processes contribute to the complexity of TMD's pathogenesis.[10] Considering the close anatomical connection between the temporomandibular joint (TMJ) and dental structures, as well as the influence of stress in triggering or worsening symptoms of temporomandibular disorders (TMD), it is important to investigate the possible link between TMDs and anxiety. Anxiety-related bruxism, which involves grinding or clenching teeth either during sleep or while awake, is often linked to TMDs or can aggravate the condition. Additionally, the ongoing pain and dysfunction caused by TMDs can lead to heightened anxiety levels in those affected.[11]

Occlusal irregularities are closely linked to temporomandibular disorders (TMD), though establishing causation is challenging with most observational research.[12]

Numerous research studies have been conducted to investigate a possible link between stress and temporomandibular disorders (TMDs) among the general population, including students. One study indicated that students experience higher levels of stress compared to the general population, making them more susceptible to developing TMDs. There is a hypothesis suggesting that academic stress plays a more significant role in the onset of TMDs among students. Additionally, being female has been identified as a predisposing factor for TMDs, attributed to greater hormonal fluctuations, estrogen levels, biological differences, social circumstances, and a lower pain threshold.[13] Epidemiologically, the occurrence of TMJ pain among the general population is estimated to be between 4% and 10%, while muscle pain ranges from 3% to 17%. Additionally, the rate of TMD is significantly influenced by age, with the highest prevalence observed in individuals aged 20 to 40 years.[14] Although there is growing recognition of temporomandibular disorders, the relationship between these disorders and stress has not been sufficiently investigated among young adults, especially students, who face significant psychological and academic demands. Research has demonstrated that stress can significantly influence the occurrence of temporomandibular dysfunction, and this happens through intricate interactions within the central nervous system.[15]

Interestingly, certain researchers asserted that college students, particularly those studying health sciences, exhibited a greater occurrence of TMD compared to their peers in other disciplines.[16]

A study discovered that anxiety and stress heightened the occurrence, severity, and duration of functional habits (bruxism), putting additional strain on the TMJ.[17] When a person experiences stress, their body triggers a heightened alertness, causing an increase in sympathetic nervous system activity. As a result, there is excessive muscle activity, especially in regions such as the jaw, which can lead to pain and dysfunction in the temporomandibular joint.[18] Students diagnosed with TMD exhibited a greater incidence of sleep bruxism, awake bruxism, empty chewing, unilateral chewing, and gum chewing when compared to those who do not have TMD. Regarding occlusions, there was a notably higher occurrence of anterior teeth overbite and overjet among students with TMD. In terms of psychological factors, a significantly increased prevalence of depression, anxiety, and sleep disturbances was found in individuals with TMD.[19]

Furthermore, stress constitutes one of the psychological elements linked to the pathophysiology of TMD. Higher stress levels in individuals with TMD correspond to raised cortisol levels, heightened activity of the HPA axis, and increased electrical activity in the masticatory muscles.[20]In a recent study, the relationship between psychological stress and the structure of the mandibular condyle was examined. The HU and bone density of the posterior section of the left condyle are considerably lower in people experiencing high stress levels compared to those with lower stress levels.[21]

In addition, the significant proportion of female participants reporting TMD symptoms is consistent with current research, which indicates that women are more vulnerable because of hormonal factors and increased exposure to stress-related situations.[22] Research has shown a significant link between temporomandibular disorders and emotional stress, as well as conditions like depression, anxiety, and physical complaints. The shift from adolescence to adulthood involves numerous challenges, including academic demands, social adjustments, and career choices, all of which can lead to psychological distress.[23]

Moreover, research indicates that increased levels of TMD correspond with a decreased quality of life for individuals. In this study, a significant moderate positive correlation was identified between the AFI scores and the subscale scores of the DASS-21.[24] For accurate assessment of TMJ pain and stress, validated diagnostic tools are essential.By employing validated assessment tools The TMJ symptoms can be

diagnosed with the Fonesca amnestic index.FAI serves as an effective diagnostic tool that conserves time in clinical settings, and its application for identifying the intensity of TMD-related symptoms early, even among healthy individuals, should be promoted.[25] Its transparency guarantees that participants can easily grasp the information, facilitating the swift and economical gathering of comprehensive data and the fast computation of the anamnestic index.[26] The Perceived Stress Scale(PSS-10) will be utilized to assess stress levels, as it is a commonly employed instrument for evaluating perceived stress in psychology. This scale assesses how much a person considers a situation to be stressful. It gauges individuals' reactions to situations that are beyond their control, unpredictable, and unwelcome.[27]

In recent years, after recognizing the condition, numerous evidence-based treatment methods have surfaced, addressing both the physical and mental dimensions of the disorder.Different physiotherapy techniques can be viewed as the initial choice for treating TMDs. Research has shown that manual therapy approaches can effectively alleviate myofascial pain, discomfort in the masticatory muscles, and enhance joint functionality. Nevertheless, the predominant approach for managing TMDs involves the implementation of therapeutic exercise routines paired with manual therapy methods, which results in the most favorable outcomes. [2]Additionally, therapy protocols incorporate manipulation techniques have been utilized to alleviate pain and impairments in individuals suffering from temporomandibular joint disorders (TMJ). It consists of various approaches, such as mandibular manipulation techniques and mobilization of the neck joints.[28]

Finally, education and self-care are key strategies for managing TMD, prioritizing awareness, coping with stress, changes in behavior, and basic jaw exercises. Medications include acetaminophen, NSAIDs, antidepressants, although SSRIs might cause bruxism. In cases of acute issues, intra-articular corticosteroid or anesthetic injections are used. Dental treatments like occlusal splints and permanent occlusal modifications help to correct alignment, ease muscle tension, and lessen parafunctional habits.[29]To help reduce TMD symptoms in this population, consistent screenings, stress management techniques, and increased awareness are suggested. Future research should emphasize longitudinal studies to gain insights into the progression and lasting effects of TMD.[12]

To summarize, various cross-sectional studies have demonstrated a significant link between psychological stress and temporomandibular joint pain in university students. However, the lack of specific data from medical universities in Karachi creates a substantial knowledge deficit. Consequently, this study intends to determine the prevalence of TMJ pain related to stress among undergraduate medical students in Karachi and to assess the strength of the relationship between perceived stress levels and the severity of TMJ pain.

Utilizing validated evaluation tools such as Fonseca's Questionnaire and the Perceived Stress Scale, this research aims to offer a thorough understanding of the psychosomatic aspects of TMJ pain in this demographic. The results are anticipated to inform the development of preventive and educational initiatives aimed at reducing stress-related musculoskeletal disorders among students.

METHODOLOGY

Study Design:

The study was a Cross-sectional study.

Sampling Technique:

The sampling technique was Non-Probability Convenience Sampling.The sample of the study selected through universities in Karachi including Indus University, Karachi Medical and Dental College, JPMC, AKU, MAJU etc.

Outcome Measures:

The two outcome measure tools were used in this research study. Fonesca Amnestic index used to assess TMJ pain and Perceived stress scale to evaluate stress level.

Data Analysis:

We interpreted and analyzed the obtained data using SPSS (version 27), the most recent version of the program, and used appropriate tests.

Graphic measurements, such as means and standard deviations, were used to account for quantitative factors. To determine any importance association between subjective variables, the Chi-square test was used. (A P-value of 0.05 is considered enormous).

Ethical Considerations:

Ethical approval for this study was obtained from the institutional review board of the respective universities involved. All participants were clearly informed about the purpose, procedures, and voluntary nature of the research before data collection. Participation was completely voluntary, and students were given the option to withdraw at any point without any consequences. Written informed consent was obtained from each participant, and anonymity and confidentiality of the data were strictly maintained. The data collected was stored securely and used solely for academic research purposes. The study involved no physical or psychological risk to the participants and did not interfere with their academic or personal activities. There were no conflicts of interest declared by the researchers.

Reliability:

To ensure the reliability of the data collection tools, the internal consistency of the two standardized questionnaires—Fonesca Amnestic Index (FAI) and Perceived stress scale (PSS-10)—was evaluated using Cronbach's alpha through SPSS software. A Cronbach's alpha value between 0.70–0.79 is considered acceptable,0.80–0.89 indicates good internal consistency, and 0.90 or above is regarded as excellent. In this study, both FAI and PSS demonstrated satisfactory reliability scores, confirming that the items within each scale were internally consistent and dependable for assessing TMJ pain and stress level, respectively, in the university medical student population.

RESULTS AND FINDINGS

This chapter discusses the results of statistical applications on dependent variables, independent variables, and their mutual relations.

This chapter of results & discussion contains four sections; First section is demographic profile which discusses the demography of all data sets. Second section is Temporomandibular Disorders which explains bifurcation of disorders. The third section is dissection of Perceived Stress Severity whereas fourth Section

contains association of temporomandibular disorders (TMD) severity with demographic factors and perceived stress. Fifth and last section discusses overall results.

Demographic Profile

Total 374 participants were included in current study among which 33.7% were male and 66.3% were female. Mean age of participants was 22.08±1.88 years. There was 79.9% of participants aged ≤23 years whereas there was 21.1% of participants from 1st year, 9.9% from 2nd year, 28.1% from 3rd year, 17.6% from 4th and 23.3% from final year. Majority of participants were enrolled in DPT (28.9%) and BSMT (26.7%) respectively. Detailed demographic profile of participants are presented in Table-1 (Figure-1 to figure-4)

Table-1: Demographic profile of participants

	Frequency (%)
Gender	
Male	126(33.7)
Female	248(66.3)
Age(years)	22.08±1.88
Age Group	
≤23 years	299(79.9)
>23 years	75(20.1)
Year of study	
1st year	79(21.1)
2nd year	37(9.9)
3rd year	105(28.1)
4th year	66(17.6)
Final year	87(23.3)
Education Program	
MBBS	35(9.4)
DPT	108(28.9)
BDS	26(7)
Pharm D	34(9.1)
BS psychology	71(19)
BSMT	100(26.7)

↕mean ± standard deviation

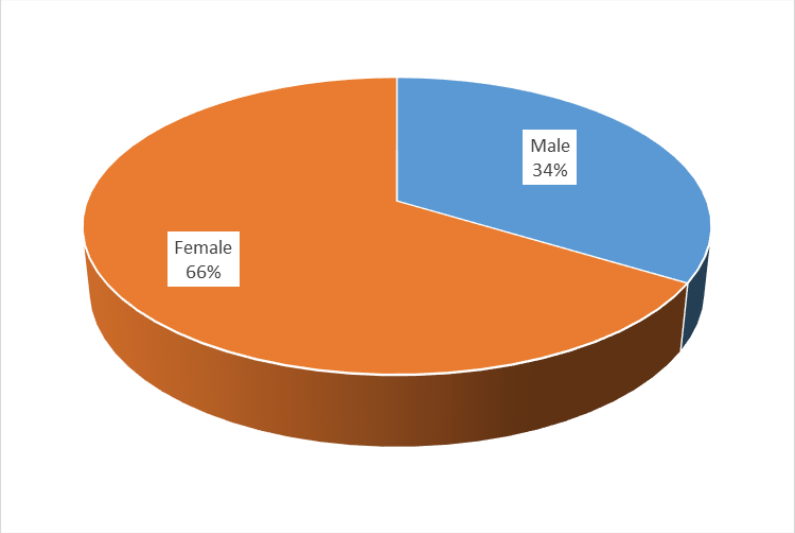

Figure-1: Gender distribution of participants

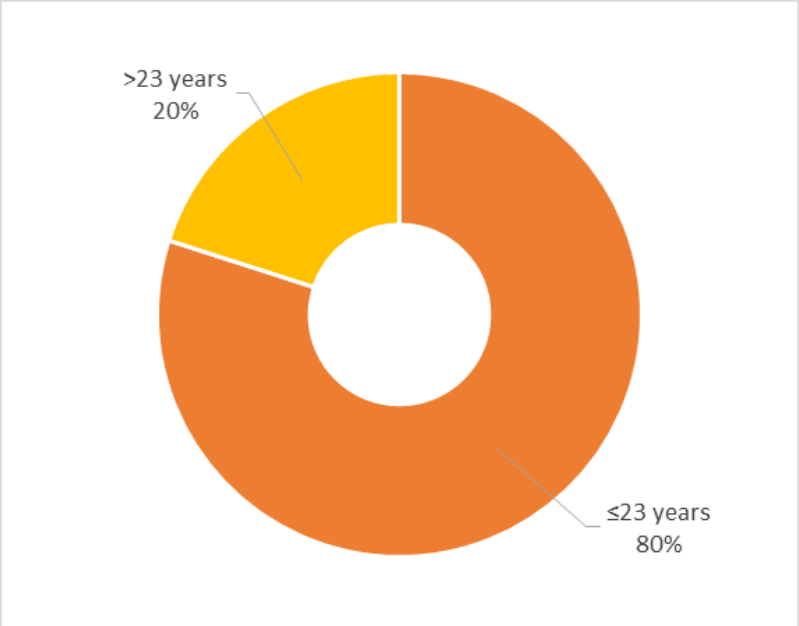

Figure-2: Distribution of participants according to age group

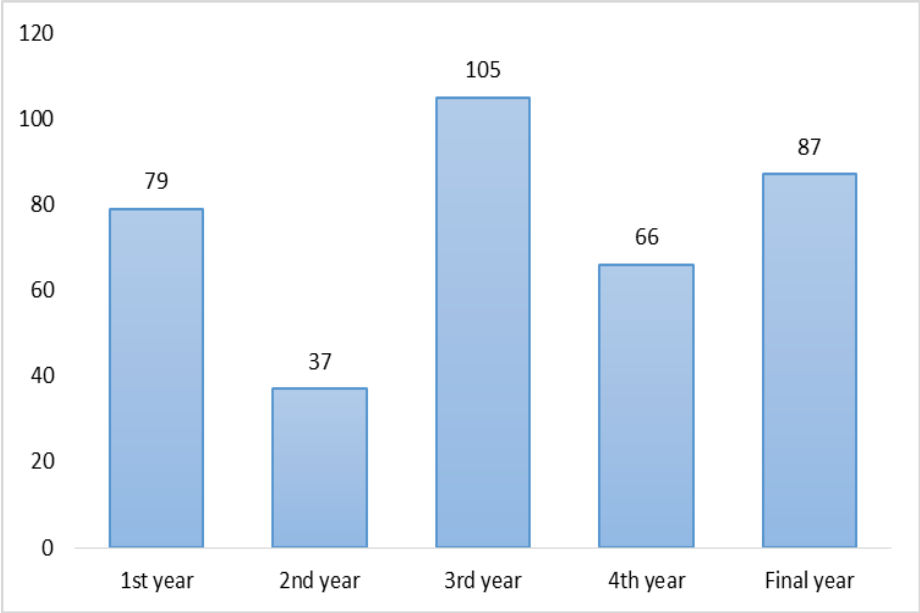

Figure-3: Distribution of participants according to study year

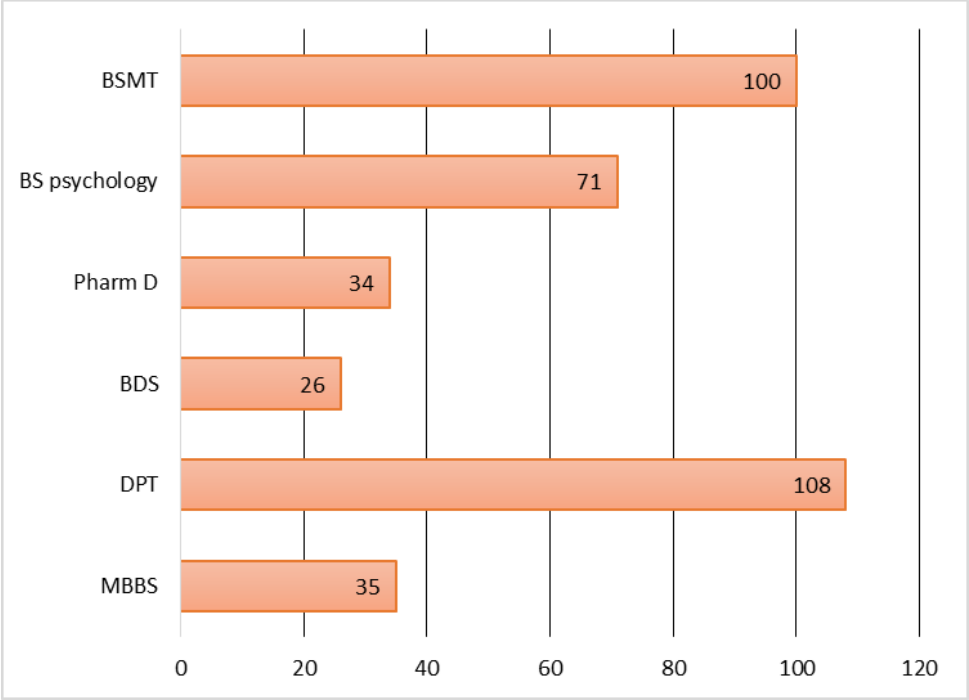

Figure-4: Distribution of participants according to education program

Temporomandibular Disorders

There was 13.9% of participants who have difficulty opening your mouth wide, 11.5% have difficulty in moving jaw to the sides, 25.4% feel fatigue or muscle pain when they chew, 51.1% have frequent headaches, 42.5% have neck pain or a stiff neck, 17.1% have ear aches or pain in craniomandibular joints, 17.9% have noticed TMJ clicking while chewing or opening mouth, 26.2% clench or grind teeth, 17.9% feel their teeth do not articulate well and 41.7% consider themselves a tense (nervous) person. Temporomandibular disorders were accessed by fonseca anamnestic index which shows good reliability (Cronbach's Alpha=0.822) with mean FAI score of 37.36±24.23 as presented in Table-2.

There was 24.3% of participants with no Temporomandibular disorder, 38.8% with mild, 23.5% with moderate and 13.4% with severe Temporomandibular disorder as presented in Table-3(Figure-5).

Table-2: Responses of participant's on fonseca anamnestic index (FAI) for temporomandibular disorders

Item#	Description	Frequency (%)		
		Yes	Sometimes	No
1	Do you have difficulty opening your mouth wide?	52 (13.9)	48 (12.8)	274 (73.3)
2	Do you have difficulty moving your jaw to the sides?	43 (11.5)	44 (11.8)	287 (76.7)
3	Do you feel fatigue or muscle pain when you chew?	95 (25.4)	94 (25.1)	185 (49.5)
4	Do you have frequent headaches?	191 (51.1)	101 (27)	82 (21.9)
5	Do you have neck pain or a stiff neck?	159 (42.5)	116 (31)	99 (26.5)
6	Do you have ear aches or pain in craniomandibular joints?	64 (17.1)	92 (24.6)	218 (58.3)
7	Have you noticed any TMJ clicking while chewing or when you open your mouth?	67 (17.9)	62 (16.6)	245 (65.5)
8	Do you clench or grind your teeth?	98 (26.2)	83 (22.2)	193 (51.6)
9	Do you feel your teeth do not articulate well?	67 (17.9)	41 (11)	266 (71.1)
10	Do you consider yourself a tense (nervous) person?	156 (41.7)	130 (34.8)	88 (23.5)

Cronbach's Alpha=0.822	**Mean FAI Score=37.36±24.23**

Table-3: Temporomandibular disorders severity

	Frequency (%)
No TMD (0-15)	91 (24.3)
Mild TMD (20-40)	145 (38.8)
Moderate TMD (45-65)	88 (23.5)
Severe TMD (70-100)	50 (13.4)
TOTAL	**374**

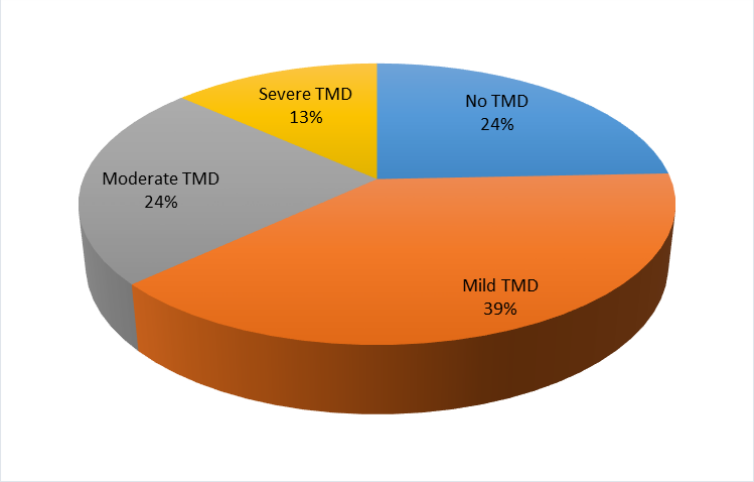

Figure-5: Distribution of participants according to temporomandibular disorders severity

Perceived Stress Severity

There was 19.5% participants who most often been upset because of something that happen unexpectedly, 18.2% felt that they were unable to control the important things in life, 22.2% have felt nervous and stressed, 23.8% felt confident about their ability to handle personal problems, 9.1% felt that things were going as per his/her way, 7.5% found that they could not cope with all the things that they had to do, 8.3% very often able to control irritations in their life, 8% felt that they were on top of things, 19% angered because of things that happened that were outside of their control and 19.5% very often felt difficulties piling up so high that they cannot overcome them. Perceived stress severity were accessed by perceived stress scale (PSS-10) which shows good reliability **(**Cronbach's Alpha=0.755) with mean PSS Score of 20.30±5.79 as presented

in Table-3.There was 10.4% of participants with low, 74.9% with moderate and 14.7% with high perceived stress as presented in Table-5(Figure-6)

Table-4: Responses of participant's on Perceived Stress Scale (PSS-10) for Perceived Stress

Description	Frequency (%)				
	Never	Almost Never	Sometimes	Fairly often	Very often
How often have you been upset because of something that happen unexpectedly?	36 (9.6)	34 (9.1)	150 (40.1)	81 (21.7)	73 (19.5)
How often have you felt that you were unable to control the important things in your life?	66 (17.6)	40 (10.7)	135 (36.1)	65 (17.4)	68 (18.2)
How often have you felt nervous and stressed?	36 (9.6)	32 (8.6)	152 (40.6)	71 (19)	83 (22.2)
How often have you felt confident about your ability to handle your personal problems?	22 (5.9)	29 (7.8)	108 (28.9)	126 (33.7)	89 (23.8)
How often have you felt that things were going your way?	38 (10.2)	37 (9.9)	187 (50)	78 (20.9)	34 (9.1)
How often have you found that you could not cope with all the things that you had to do?	48 (12.8)	48 (12.8)	177 (47.3)	73 (19.5)	28 (7.5)
How often have you been able to control irritations in your life?	26 (7)	56 (15)	178 (47.6)	83 (22.2)	31 (8.3)
How often have you felt that you were on top of things?	43 (11.5)	31 (8.3)	180 (48.1)	90 (24.1)	30 (8)
How often have you been angered because of things that happened that were outside of your control?	33 (8.8)	37 (9.9)	137 (36.6)	96 (25.7)	71 (19)
How often have you felt difficulties were piling up so high that you could not overcome them?	52 (13.9)	51 (13.6)	148 (39.6)	50 (13.4)	73 (19.5)
Cronbach's Alpha=0.755	**Mean PSS Score=20.30±5.79**				

Table-5: Perceived stress severity by PSS-10

	Frequency (%)
Low (0-13)	39 (10.4)
Moderate (14-26)	280 (74.9)
High (27-40)	55 (14.7)
TOTAL	**374**

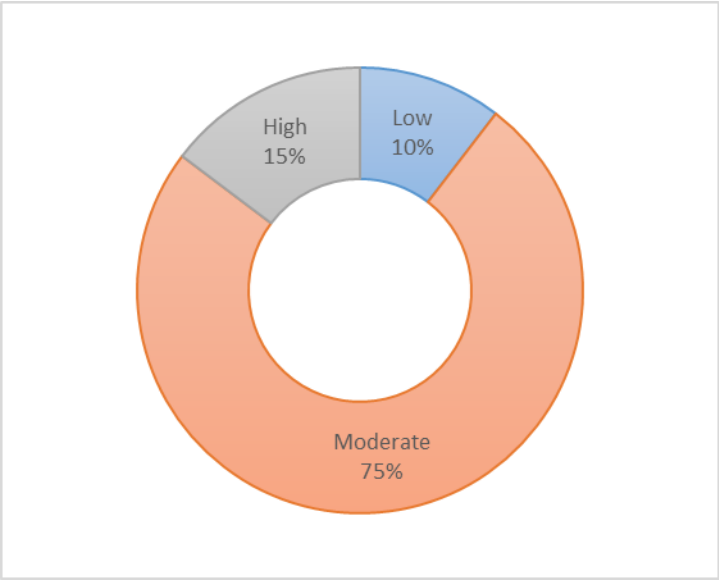

Figure-6: Distribution of participants according to perceived stress severity

Association of temporomandibular disorders (TMD) severity with demographic factors and perceived stress

We found significant association of TMD severity with gender (p=0.000), study year (p=0.000), education program (p=0.000) and perceived stress severity (p=0.000) whereas no significant association were found with age group (p=0.073). Detailed results of association of temporomandibular disorders (TMD) severity with demographic factors and perceived stress are presented from Table-6 to Table-10 respectively.

Table-6: Frequency and association of TMD severity according to gender

	TMD severity Frequency (%)					P-Value
	No TMD	**Mild**	**Moderate**	**Severe**	**Total**	
Male	56(61.5)	46(31.7)	15(17)	9(18)	**126**	0.000*
Female	35(38.5)	99(68.3)	73(83)	41(82)	**248**	

Chi-square/Fisher exact test was applied.

P<0.05 considered as significant

*Significant at 0.05 level.

Table-7: Frequency and association of TMD severity according to age group

	TMD severity Frequency (%)					P-Value
	No TMD	**Mild**	**Moderate**	**Severe**	**Total**	
≤23 years	80(87.9)	117(80.7)	66(75)	36(72)	**299**	0.073**
>23 years	11(12.1)	28(19.3)	22(25)	14(28)	**75**	
Total	**91**	**145**	**88**	**50**	**374**	

Chi-square/Fisher exact test was applied.

P<0.05 considered as significant

**Not Significant at 0.05 level.

Table-8: Frequency and association of TMD severity according to study year

	TMD severity Frequency (%)					P-Value
	No TMD	**Mild**	**Moderate**	**Severe**	**Total**	
1st year	36(39.6)	29(20)	14(15.9)	0(0)	**79**	0.000*
2nd year	8(8.8)	14(9.7)	13(14.8)	2(4)	**37**	
3rd year	23(25.3)	42(29)	21(23.9)	19(38)	**105**	
4th year	11(12.1)	25(17.2)	14(15.9)	16(32)	**66**	
Final year	13(14.3)	35(24.1)	26(29.5)	13(26)	**87**	
Total	**91**	**145**	**88**	**50**	**374**	

Chi-square/Fisher exact test was applied.

P<0.05 considered as significant

*Significant at 0.05 level.

Table-9: Frequency and association of TMD severity according to education program

	TMD severity Frequency (%)					P-Value
	No TMD	**Mild**	**Moderate**	**Severe**	**Total**	
MBBS	8(8.8)	10(6.9)	13(14.8)	4(8)	**35**	0.000*
DPT	18(19.8)	50(34.5)	29(33)	11(22)	**108**	
BDS	2(2.2)	8(5.5)	6(6.8)	10(20)	**26**	
Pharm D	1(1.1)	7(4.8)	16(18.2)	10(20)	**34**	
BS Psychology	15(16.5)	38(26.2)	9(10.2)	9(18)	**71**	
BSMT	47(51.6)	32(22.1)	15(17)	6(12)	**100**	
Total	**91**	**145**	**88**	**50**	**374**	

Chi-square/Fisher exact test was applied.

P<0.05 considered as significant

*Significant at 0.05 level.

Table-10: Frequency and association of TMD severity according to perceived stress severity

	TMD severity Frequency (%)					P-Value
	No TMD	**Mild**	**Moderate**	**Severe**	**Total**	
Low	21(23.1)	14(9.7)	2(2.3)	2(4.0)	**39**	0.000*
Moderate	70(76.9)	113(77.9)	62(70.5)	35(70)	**280**	
High	0(0)	18(12.4)	24(27.3)	13(26)	**55**	
Total	**91**	**145**	**88**	**50**	**374**	

Chi-square/Fisher exact test was applied. P<0.05 considered as significant

*Significant at 0.05 level.

STUDY LIMITATIONS

This study has several limitations that should be considered when interpreting the findings. The use of a non-probability convenience sampling method may introduce selection bias, limiting the generalizability of the results to the broader population of medical students in Karachi. The cross-sectional design restricts the ability to establish causal relationships between stress and TMJ pain, as it captures only a single point in time. Data collection relied on self-reported questionnaires and online surveys, which are subject to recall bias, response bias, and social desirability bias. Additionally, the exclusion of students with psychiatric disorders, systemic conditions, or prior facial trauma may underestimate the true prevalence of stress-related TMJ dysfunction. The six-month study duration may not account for variations in stress or TMJ symptoms over time, particularly during examination periods. Furthermore, the study lacked objective clinical assessments of TMJ function, increasing the risk of misclassification. Uncontrolled confounding factors, such as lifestyle, ergonomics, and coping mechanisms, may also influence both stress levels and TMJ pain, while reliance on online surveys could exclude students with limited internet access.

RECOMMENDATIONS FOR FUTURE RESEARCH

Several strategies can be employed to mitigate the limitations identified in this research. To reduce selection bias and improve generalizability, future studies could use probability-based sampling techniques, such as stratified or random sampling, across multiple universities and academic disciplines. Longitudinal study designs would allow for the assessment of causal relationships between stress and TMJ pain over time and capture variations during high-stress periods, such as examinations. Incorporating objective clinical assessments, including physical examination or imaging of the TMJ, alongside self-reported questionnaires, would enhance the accuracy of TMD diagnosis and severity classification. Expanding inclusion criteria to consider students with psychiatric conditions or systemic disorders could provide a more comprehensive understanding of stress-related TMJ dysfunction. Additionally, controlling for confounding factors, such as lifestyle habits, ergonomics, and coping strategies, through multivariate analysis or standardized assessment tools would strengthen the study's validity. Finally, combining online surveys with in-person data collection can help include participants with limited internet access, ensuring a more representative sample.

CONCLUSION

The present study shows that the prevalence of temporomandibular disorder (TMD) is high among medical and allied health science students in Karachi, with the majority of participants having mild to moderate severity as assessed by the Fonseca History Index. Common symptoms include headaches, neck pain, muscle fatigue when chewing, teeth clenching, and clicking in the temporomandibular joints, representing a significant symptom burden in this population. Perceived stress levels were mainly moderate to high, and TMJ severity was significantly associated with gender, study year, academic program, and perceived stress. Higher severity was observed especially in female students, older adults, and those experiencing increased stress levels, but no significant association with age was found. These findings suggest that temporomandibular disorder is not an isolated condition but is part of a larger picture that includes psychological stress, academic demands, and behavioral factors such as tooth grinding.

Clinically, the results highlight the importance of early detection, stress management, physical therapy, counseling, and educational interventions. At the institutional level, integrating mental health and musculoskeletal health supports into student services can help reduce discomfort associated with TMJ and improve overall well-being. Despite limitations related to study design and self-report data, these findings highlight the need for longitudinal studies and objective clinical assessments to better understand causality and long-term outcomes.

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CONFLICT OF INTERST

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