ORIGINAL ARTICLE

ANNALS OF PUNJAB MEDICAL COLLEGE

Prevalence of Temporomandibular Disorders in Dental House Officers of Pakistan & Its Association with Biopsychosocial Factors- A Retrospective Study

Maryam Mumtaz[1], Kirn Zulfiqar[2], Rida Waseem[3], Hafiz Shaker Mahmood[4], Haider Ali[5], Bilal Yousaf[6]

1 *Senior Registrar, Department of Prosthodontics, Institute of Dentistry, CMH Lahore Medical & Dental College, Lahore, Pakistan*
Concept/Design, Data acquisition, Analysis, Drafting manuscript, Critical revision of manuscript, Final approval

2 *Consultant Oral and Maxillofacial Surgeon, Fatima Jinnah Institute of Dental Sciences, Lahore*
Concept/Design, Data acquisition, Analysis, Critical revision of manuscript, Final approval

3 *Assistant Professor, Department of Operative Dentistry, Islamabad Medical & Dental College, Pakistan*
Concept/Design, Data acquisition, Analysis, Critical revision of manuscript, Final approval

4 *Consultant Maxillofacial Surgeon at Punjab Dental Hospital, Lahore Pakistan*
Concept/Design, Data acquisition, Analysis, Critical revision of manuscript, Final approval

5 *Senior Demonstrator at de'Montmorency College of Dentistry, Lahore Pakistan*
Concept/Design, Data acquisition, Analysis, Critical revision of manuscript, Final approval

6 *Consultant Oral and Maxillofacial Surgery At Fatima Jinnah Institute Of Dental Sciences, Lahore Pakistan*
Concept/Design, Data acquisition, Analysis, Critical revision of manuscript, Final approval

CORRESPONDING AUTHOR
Dr. Maryam Mumtaz
Senior Registrar, Department of Prosthodontics, Institute of Dentistry, CMH Lahore Medical & Dental College, Lahore, Pakistan
Email: drmaryam_414@hotmail.com

Submitted for Publication: 08-05-2024
Accepted for Publication 15-06-2024

How to Cite: Mumtaz M, Zulfiqar K, Waseem R, Mahmood HS, Ali H, Yousaf B. Prevalence of Temporomandibular Disorders in Dental House Officers of Pakistan & Its Association with Biopsychosocial Factors- A Retrospective Study. APMC 2024;18(2):126-132. **DOI: 10.29054/APMC/2024.1604**

ABSTRACT

Background: Temporomandibular disorders have high prevalence, particularly in dental graduates. They have a biopsychosocial model of pathogenesis, with gender, financial status, working conditions having possible associations. Fonseca Anamnestic Index is a useful tool for assessment of presence of TMD. **Objective:** To assess prevalence of TMDs in dental house officers of Pakistan and to evaluate the association of TMDs with biopsychosocial factors such as gender, pay status, house job in public or private sector. **Study Design:** cross sectional study. **Settings:** Department of Prosthodontics, institute of Dentistry, CMH Lahore Medical & Dental Collage, Lahore, Pakistan. **Duration:** One year from February 2023 to February 2024. **Methods:** Data was collected via online validated forms, from 550 dental house officers, working in public and private sector, in Islamabad, Lahore and Karachi. Questions included gender, age, month, and department of house job, pay status and whether house job was in public or private sector. TMD status was evaluated via Fonseca Anamnestic Index. 520 responses were collected and analysed using SPSS 23.0. **Results:** Prevalence of TMDs was 61.1% out of which 43 % had mild TMD, 20 % had moderate TMD and 3.1 % had severe TMD. Higher, albeit statistically non-significant, prevalence was found in females, unpaid house officers and those working in public sector. **Conclusion:** There is high prevalence of TMDs in dental house officers in major cities of Pakistan. Association of TMD with gender, pay status, and public/private sector remains inconclusive but higher prevalence of TMDs in females, unpaid, and public sector dental house officers mandates further investigation behind causative factors, and implementation of policies to ensure paid house jobs and progressive development of healthcare system, particularly in public sector.

Keywords: *Temporomandibular disorders, Temporomandibular joint, Prevalence, Pain.*

INTRODUCTION

Temporomandibular disorders (TMDs) is a collective term used for a group of musculoskeletal conditions which involve the masticatory muscles, temporomandibular joints, and associated structures.[1] The signs & symptoms of these disorders include pain, dysfunction, decreased range of motion, masticatory muscle fatigue and limited mouth opening.[1-4] These may lead to physical and psychological comorbidities such as headaches, tinnitus, irritable bowel syndrome, chronic fatigue syndrome, sleep disturbances, bruxism, and depression.[1-4] TMDs are reported to be the most common cause of non-odontogenic pain in the orofacial region.[3,4] They may last for a short while and then result in self-resolution of symptoms, or they may turn chronic and last for years.[1-,4] The aetiology behind TMDs is believed to be multifactorial with biopsychosocial elements involved, with approximately 76 % of patients with TMDs showing moderate to severe somatization and 61% showing clinical signs of depression.[3] These elements may interact with environmental stressors or initiating factors such as

macro/micro trauma leading to painful TMDs. The perpetuation of these disorders may then be influenced by pain thresholds, socioenvironmental stimulants, and psychological states of the patient.[3,6,7]

Prevalence of TMDs differs as per geographic region, professions, and gender. High female to male ratio is also observed.[7-9] According to multiple cross-sectional surveys performed globally, students have a high percentage of TMDs, particularly in the healthcare sector.[8-9] Dental profession has documented high stress levels, with a reported higher female to male ratio.[9] This is due to factors such as increased workloads, workplace/family dynamics and financial considerations.[6-9] The environmental and financial conditions differ between public and private sector hospitals, which may affect dental professionals, leading to TMDs.[4] This is particularly significant in third world countries like Pakistan, where financial status plays an important role in mental and physical health.

Due to high prevalence of TMDs in global population, it is prudent to screen all patients who may have factors predisposing to TMDs. Various screening tools for TMDs have been developed over the years, such as questionnaires, patient-history indices, clinical indices, and diagnostic criteria.[10,11] One such index used is Fonseca Anamnestic Index (FAI). The FAI is one of the most popular indices, due to excellent reliability and validity. It is a 10-point questionnaire, which assesses both prevalence and severity of TMD, and may be used with ease in clinical practice.[11]

Epidemiological studies of TMDs under various psychosocial conditions are important, so that predisposing factors may be identified, and multimodality preventive/corrective measures and programs may be initiated. Studies have assessed TMDs in dental professionals, but no study has assessed and compared prevalence of TMDs in dental house officers working in public and private sectors, in Pakistan. Additionally, the association of factors such as gender and pay difference, occurring between both sectors has not been studied before in this region. This research aims to assess the prevalence of TMDs in dental house officers working in public and private sectors, in three major cities of Pakistan. It also aims to evaluate the association of psychosocial factors such as gender, pay status and working conditions between public and private sectors, with TMD.

METHODS

This was a multi-centre study, carried out in dental colleges in Lahore, Karachi, and Islamabad, belonging to both public and private sectors. The inclusion criteria consisted of dental house officers working in public and private sectors, in paid and unpaid positions. Exclusion criteria consisted of dental house officers with any diagnosed systemic medical condition and those not consenting to be a part of study. Sample size was calculated by taking a population size of 4500, confidence level of 95% and 5% margin of error. The sample thus calculated came out to be approximately 400. But considering the average response rate of online questionnaires, the sample was increased to 550, to accommodate for non-responsive participants. After taking ethical approval from de 'Montmorency College of Dentistry Lahore, Letter No.4782, validated questionnaires were circulated via online google forms, to 550 house officers with acquisition of responses from 520 house officers (response rate of 91.4%). These questionnaires consisted of informed consent, questions pertaining to biodata of participants, their current rotational department, month of house job and pay status. For assessment of temporomandibular status, Fonseca Anamnestic Index (FAI), consisting of 10 questions, was used. Each question had a 3-point Likert scale, which was assessed as follows. Response of "Yes" was denoted 10 points, "Sometimes" was denoted 5 points and "No" was denoted 0 points. Total score of the FAI was determined by sum of the scores of all items, with the following classification.[16]

0-15 points = No signs and symptoms of TMD

20-45 points = Mild TMD

50-65 points = Moderate TMD

70-100 points = Severe TMD

Data was analysed using SPSS version 23.0. Quantitative analysis was done to present frequencies for prevalence and severity of Temporomandibular Disorders. Qualitative variables such as gender, age, pay status, month and department of house job were presented as frequencies and percentages. The distribution of data obtained via FAI was analysed by chi square test. Co-relation between gender and pay status with TMD prevalence and severity, was analysed by independent sample t-test, with p value of < 0.05 considered as significant.

RESULTS

Data was stratified according to age, gender, current department of house job (Figure 1) and duration of house job (Figure 2). The mean age of participants was 24 years ± 1.304, out of which 18 % were males and 81.9 % were females. 61 % of participants were working in public sector, whereas 38 % were working in private institutes. 38% of participants working in public sector reported TMDs whereas 28% of participants in private institutes

reported TMDs. 14 % of participants were unpaid, whereas 86 % were paid.

Table 1: Distribution of House Officers per Department

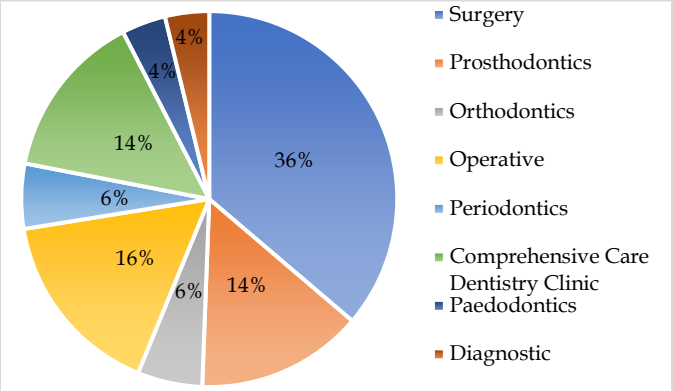
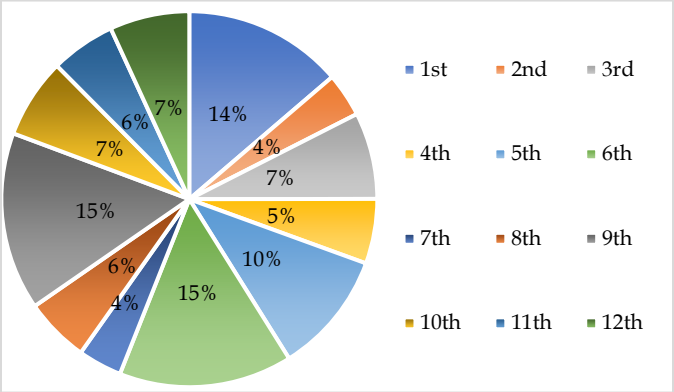


Figure 2: Distribution of house officers as per month of house job



The distribution of responses for each item of FAI was analysed by chi square test. (Table 1).

The prevalence of TMDs was as follows. 34% had no signs and symptoms of TMD whereas 66.1 % were suffering from some form of TMD. Out of these 66.1 %, 43 % had mild TMD, 20 % had moderate TMD whereas 3.1 % had severe TMD.

Table 1: Distribution of responses for each item of Fonseca Anamnestic Index (FAI)

Question (FAI)	Answer % n=520		
	Yes	Sometimes	No
Do you have difficulty opening your mouth wide?	5	16.8	78
Do you have difficulty moving your jaw to the sides?	4.4	11.9	83.8
Do you feel fatigue or muscle pain when you chew?	13.1	18.1	68.8
Do you have frequent headaches?	28.8	22.5	48.8
Do you have neck pain or a stiff neck?	24.2	27.5	48.1
Do you have earaches or pain in that area (Temporo-mandibular jaw)?	12.5	16.3	71.3
Have you ever noticed any noise in your temporo-mandibular joint while chewing or opening your mouth?	28.8	19.4	51.9
Do you have any habits such as clenching or grinding your teeth?	26.3	20	53.4
Do you feel that your teeth do not come together well?	17.5	12.5	70
Do you consider yourself a tense (nervous) person?	37.5	30.6	31.9

The distribution of responses to the FAI in paid and unpaid participants is given in Table 2. The co-relation of TMDs with pay status was calculated via Independent Sample t Test and is given in Table 3. p value of < 0.05 was considered as significant. There was a higher number of paid participants as compared to unpaid. Out of the total number of unpaid participants, 34.5 % reported signs/symptoms of TMD whereas out of the total number of paid participants, 31.9 % reported signs/symptoms of TMD. Although there was no statistical significance between prevalence of TMD amongst paid and unpaid participants, almost 64 % of unpaid participants reported suffering from stiff neck and neck pain as compared to 49 % in paid participants. 77 % of unpaid participants reported the presence of a nervous/tense disposition as compared to 65 % of paid participants.

Table 2: Distribution of responses in Paid and Unpaid House Officers

Question (Fonseca Anamnestic Index)	Paid % n=448	Unpaid % n=72
Do you have difficulty opening your mouth wide?	21	23
Do you have difficulty moving your jaw to the sides?	13.7	13.6
Do you feel fatigue or muscle pain when you chew?	31.8	27
Do you have frequent headaches?	49	31.8
Do you have neck pain or a stiff neck?	49	63.6
Do you have earaches or pain in that area (Temporo-mandibular jaw)?	28	22.7
Have you ever noticed any noise in your temporo-mandibular joint while chewing or opening your mouth?	48.5	45.5
Do you have any habits such as clenching or grinding your teeth?	48.5	36
Do you feel that your teeth do not come together well?	28.9	36
Do you consider yourself a tense (nervous) person?	65	77

Table 3: Co-relation of TMD with Pay Status

Question (Fonseca Anamnestic Index)	Levene's test for equality of variances		t	Sig (2 tailed)	Mean Difference	Std Error Difference	95% Confidence Interval of the Difference	
	F	Sig					Lower	Upper
Do you have difficulty opening your mouth wide?	.288	.592	-.815	158	.416	-.085	.104	-.291
Do you have difficulty moving your jaw to the sides?	.077	.782	.716	158	.475	.064	.089	-.112
Do you feel fatigue or muscle pain when you chew?	.033	.856	.421	158	.675	.055	.130	-.202
Do you have frequent headaches?	.182	.670	-.200	158	.842	-.033	.165	-.358
Do you have neck pain or a stiff neck?	.649	.422	-1.072	158	.285	-.180	.168	-.511
Do you have earaches or pain in that area (Temporo-mandibular jaw)?	.044	.834	.502	158	.617	.062	.123	-.182
Have you ever noticed any noise in your temporo-mandibular joint while chewing or opening your mouth?	.000	.996	-.644	158	.521	-.102	.159	-.415
Do you have any habits such as clenching or grinding your teeth?	1.526	.219	1.387	158	.167	.216	.156	-.092
Do you feel that your teeth do not come together well?	.344	.558	.352	158	.725	.043	.124	-.200
Do you consider yourself a tense (nervous) person?	.308	.579	1.508	158	.134	.283	.188	-.088

The distribution of responses to the FAI in both genders is given in Table 4. The co-relation of TMDs with gender was calculated via Independent Sample t Test and is given in Table 5.

p value of < 0.05 was considered as significant. There was a higher number of female participants as compared to male participants. Although no statistically significant difference was found between overall prevalence amongst males and females, there was a high female to male ratio (3.29). Out of total number of female participants, 79% had TMDs, whereas 24% out of the male participants reported TMDs. 32.8% of females reported having pain in the temporomandibular jaw area as compared to 6.9% of males. Similarly, a much higher number of females reported having a tense/nervous disposition (70%) as compared to males (27.6%).

Table 4: Distribution of responses in Males and Females

Question (Fonseca Anamnestic Index)	Male (n=94)	Female (n=426)
Do you have difficulty opening your mouth wide?	20.7	21.4
Do you have difficulty moving your jaw to the sides?	20.7	14.5
Do you feel fatigue or muscle pain when you chew?	24	48
Do you have frequent headaches?	27.5	57
Do you have neck pain or a stiff neck?	41.4	54.9
Do you have earaches or pain in that area (Temporo-mandibular jaw)?	6.9	32.8
Have you ever noticed any noise in your temporo-mandibular joint while chewing or opening your mouth?	37.9	47.3
Do you have any habits such as clenching or grinding your teeth?	17.3	53.4
Do you feel that your teeth do not come together well?	17.3	30.5
Do you consider yourself a tense (nervous) person?	27.6	70.2

Table 5: Co-relation of TMD with Gender

Question (Fonseca Anamnestic Index)	Levene's test for equality of variances		t	Sig (2 tailed)	Mean Difference	Std Error Difference	95% Confidence Interval of the Difference	
	F	Sig					Lower	Upper
Do you have difficulty opening your mouth wide?	.481	.489	-.652	.516	-.061	.093	-.245	.123
Do you have difficulty moving your jaw to the sides?	2.251	.136	.869	.386	.069	.080	-.088	.227
Do you feel fatigue or muscle pain when you chew?	7.923	.006	-.460	.646	-.053	.116	-.283	.176
Do you have frequent headaches?	11.355	.001	.519	.605	.076	.147	-.214	.367
Do you have neck pain or a stiff neck?	1.224	.270	.408	.684	.061	.150	-.236	.358
Do you have earaches or pain in that area (Temporo-mandibular jaw)?	6.221	.014	-.033	.973	-.004	.110	-.222	.214
Have you ever noticed any noise in your temporo-mandibular joint while chewing or opening your mouth?	.743	.390	-.678	.499	-.096	.142	-.376	.184
Do you have any habits such as clenching or grinding your teeth?	8.886	.003	-.165	.869	-.023	.140	-.300	.253
Do you feel that your teeth do not come together well?	2.407	.123	.033	.973	.004	.110	-.214	.222
Do you consider yourself a tense (nervous) person?	26.363	.000	.202	.840	.034	.169	-.300	.368

DISCUSSION

Temporomandibular disorders present a significant problem in public health, prevalent in approximately 5 to 12 % of the population globally.[12] The actual prevalence of these disorders in different regions of the world remains a matter of debate, since there are multiple modalities that are used for assessing the presence or absence of TMDs.[12-14] Some of these indices such as the Dual Axis Research Diagnostic Criteria (RDC/TMD) and the Diagnostic Criteria for TMDs (DC/TMD) are very accurate and reliable, but difficult to use routinely, due to their time consuming and complex assessment protocol.[10] This study used the Fonseca Anamnestic Index, which is an easy to implement, 10 question questionnaire, to find prevalence of TMDs amongst dental house officers, working in public and private sectors of Pakistan. There are very few studies that have assessed the impact of financial status on the presence of TMDs, and none performed in 3 major cities of Pakistan concurrently, i.e. Islamabad, Lahore, and Karachi. This study also evaluated the prevalence and association of psychosocial factors such as gender, pay status and working conditions in public and private sectors of dentistry, on the prevalence of TMDs in this population.

Overall Prevalence of TMDs: Prevalence of TMDs in general adult population is reported to be 10%.[12] Students in particular are reported to have higher stress levels due to workload, complex curriculums, exam pressure amongst numerous factors.[12-17] Since psychosocial stress is directly related to TMDs, prevalence studies of TMDs amongst this population are of particular significance. According to studies conducted on students, TMDs were found to be prevalent in 69% of university students in Jordan, 53 - 59% in Brazil, 49 % in Saudi Arabia and 42% in India.[13-17] In present study, conducted on dental house officers, 66.1 % reported TMD signs and symptoms, out of which 43 % had mild TMD, 20 % had moderate TMD and 3.1 % had severe TMD. These results are similar to another study conducted in Pakistan, which evaluated prevalence of TMD in medical and dental graduates utilizing the FAI, in which 62% of students reported with TMD [9]. Highest prevalence observed in present study was of mild TMD (43%), which agrees with the results reported by Dekon *et al*,[14] Pedroni *et al*,[15] and Karthik *et al*,[16] all of whom used FAI to assess TMDs. The prevalence found in present study i.e. 61.1% is significantly higher than reported for general adult population which is approximately 10-12%.[12] Dental graduates are reported to be at higher risk of developing TMDs due to various reasons. These include academic stress along with patient care. They also have increased knowledge and awareness regarding TMDs, leading to better recognition of signs and symptoms thus more forthcoming responses in questionnaires.[13-17] This was corroborated by Zafar MS *et al*., who reported a higher prevalence of TMDs in dental graduates, as compared to medical and pharmacy graduates.[17]

In present study, 38% participants working in public sector reported TMDs as compared to 28% participants in private sector. Different working conditions exist in both sectors, particularly in healthcare.[18,19] Andreas *et al*[20] reported that public and private healthcare sectors differ in terms of autonomy, workload, and flexibility. Workload demands were found to be significantly greater in public sector, with less flexibility. A study comparing work conditions and services provided by public and private healthcare centres in Lahore, Pakistan, concluded that private healthcare centres have better infrastructure, regular funding, and more optimal work conditions.[18] Public centres on the other hand are largely

ignored by the government, with stressful conditions for both doctors and patients.[18-20] These psychologically and financially sub optimal conditions may be linked with a higher prevalence of TMDs in this sector,[18-20] which is confirmed by the results of this study. There is a need for government to focus on the development of better conditions of public sector hospitals and institutes, with regular and equitable fund distribution, and monitoring.

Various studies report higher prevalence of development of TMDs in females than males.[1,21-23] Some contradictory studies report that actual incidence of pathological changes within temporomandibular joint is not significantly higher in females.[21-23] In present study, although no statistically significant difference was found between prevalence of self-reported TMDs in females and males, but the percentage of females with TMDs (79.3%) was much higher than males (24%) at a ratio of 3.29. Three causal factors may be examined for this trend. Bio-physiological factors, behavioural factors such as stress prone personality types, and genetic factors which may predispose females to be more vulnerable to TMD.[21-23] Estrogen in particular is believed to play a significant role in increased pathogenesis of TMDs in females, via various mechanisms.[21] It affects the limbic system (controls emotions and behaviour), which leads to lowered pain thresholds and increased pain perceptions.[22,23] Hormonal imbalances can also lead to disturbed emotions, depression, and suicidal tendencies, contributing to TMD.[21-23] A higher percentage of females in present study reported tense personality types, which is a behavioural risk indicator. During gestation and menstrual cycles, TMD symptoms are reported to increase, possibly due to hormonal fluctuations.[23] Jedynak *et al*[22] reported possible roles of increased levels of progesterone and relaxin in alleviating TMD symptoms, during pregnancy. Estrogen receptors have also been found in much higher number on temporomandibular joint of females as compared to males.[22,23] These are believed to cause increased laxity and nociception.[22,23] According to Dalewski *et al*, genetically, estrogen receptor polymorphisms may not only explain the increased tendency of females to suffer from TMD symptoms, but also thediffering clinical presentations.[21,22] Females have also been shown to self-report pain and discomfort more than males, which can lead to an apparent increased prevalence.[23]

Inflation and decrease in GDP due to economic crisis of 2008 and COVID-19 pandemic has been observed, particularly in a third world country like Pakistan.[24] Almost 85% of teens and young adults in Pakistan are suffering from stress whereas almost 45% of the population in this age group is suffering from depressive disorders.[25] Mori *et al*[25] reported a direct link between job conditions, psychological stress, and occurrence of TMDs. Financial instability has shown to result in severe stress and mental disorders, particularly in health sector.[24,25] Health professionals work under gruelling conditions, with limited remuneration particularly at the start of career such as House job. In present study, 86% of the house officers were paid, whereas 14% were working without any pay. This is quite an alarming figure in today's economic conditions. A higher, albeit statistically non-significant, percentage of unpaid house officers reported with TMDs (34.5%) as compared to paid house officers (31.9%). 64% of unpaid house officers reported symptoms of stiff neck and headaches as compared to 49% in paid. 77% of unpaid house officers reported to have a tense personality whereas 65% of paid participants reported the same. Based on this data, a link may be suggested between the stress levels generated by the financial implications of working without pay, and occurrence of TMDs. Studies also demonstrate that TMD itself may cause a financial burden since it is a chronic disorder requiring consistent treatment.[24,25] It also affects day-to-day functioning of individuals leading to a vicious cycle of stress, sub optimal performance, and financial burden. Governments and administrative figures have important roles in mitigating these effects. The allocation of adequate resources and budget, as well as implementation of mandatory paid house jobs by apex bodies may serve as an important step in the direction of reducing the psychological pressures faced by currently unpaid professionals. Institutes should be monitored regularly by these apex bodies, to ensure that sufficient monetary benefits are being provided to health professionals.[24,25]

CONCLUSION

Prevalence of TMDs in dental house officers, in the major three cities of Pakistan, was 66.1%. There was no statistically significant association between gender and pay status with TMDs, but females had a higher prevalence than males with a female to male ratio of 3.29. A higher percentage of unpaid house officers reported TMDs as compared to paid house officers. Similarly a higher percentage of public sector house officers reported TMDs as compared to private sector house officers.

LIMITATIONS

There are a few limitations to this study. A larger sample size, with increased number of institutions included would improve the applicability of the results to the general health professionals' population. The use of FAI, which relies on self-report of TMDs may under or overestimate the actual presence of pathology. Further investigation in the factors surrounding pay status of healthcare professionals may improve the understanding of causative and corrective measures in this regard.

SUGGESTIONS / RECOMMENDATIONS

Further research is required to fully understand the hormonal and genetic basis of increased tendency of TMDs in females. This may lead to breakthrough developments in hormonal therapy or genetic engineering solutions for this disease.

Measures need to be taken at government and apex body level, for drafting and implementation of strategies to ensure equitable funds allocation, infrastructure and working conditions for healthcare centres, particularly in the public sector. Ensuring adequate pay for all dental surgeons, beginning from house job may prove as an effective step to reduce the occurrence of stress related chronic disorders such as Temporomandibular Disorders.

CONFLICT OF INTEREST / DISCLOSURE

Nothing to disclose.

ACKNOWLEDGEMENTS

We acknowledge participants of the study for their cooperation which enable us to complete our work.

REFERENCES

1. Palmer J, Durham J. Temporomandibular disorders. BJA education. 2021 Feb 1;21(2):44-50.
2. Yekkalam N. Perspectives on signs and symptoms indicative of temporomandibular disorders among adults (Doctoral dissertation, Umeå Universitet).
3. Zhang Q, Yuan S, Deng K, Li X, Liang Y, Wu A, Pathak JL, Liu H. Correlation of patients' demographics and clinical symptoms with temporomandibular disorders. CRANIO®. 2023 Sep 3;41(5):432-9.
4. Nazir MA, Izhar F, Hassan S, Tanvir M, Nemat F, Ashraf MW, Alamri A. Temporomandibular Disorders among Dental Students in Pakistan: Assessment of Prevalence, Severity, and Associated Factors Based on Questionnaire. Scientifica. 2023 Jul 18;2023.
5. Karaman A, Sapan Z. Evaluation of temporomandibular disorders, quality of life, and oral habits among dentistry students. CRANIO®. 2023 Jul 4;41(4):316-22.
6. Srivastava KC, Shrivastava D, Khan ZA, Nagarajappa AK, Mousa MA, Hamza MO, et al. Evaluation of temporomandibular disorders among dental students of Saudi Arabia using Diagnostic Criteria for Temporomandibular Disorders (DC/TMD): a cross-sectional study. BMC Oral Health. 2021 Dec;21:1-1.
7. Homeida L, Felemban E, Kassar W, Ameen M, Aldahlawi S. Temporomandibular joints disorders (TMDs) prevalence and their relation to anxiety in dental students. F1000Research. 2022;11.
8. Tak MM, Chalkoo AH, Devi R. An institutional survey for self-awareness assessment of temporomandibular joint disorder symptoms prevailing in dental faculty, staff members & dental students in Government Dental College Srinagar. Journal of Advanced Medical and Dental Sciences Research. 2022 Jun 1;10(6):36-42.
9. Fazal M, Umair N, Masud F, Hussain SA, Ashfaq MT, Khan U. Frequency of Temporomandibular Joint Disorders (TMDS) Among University Students from Islamabad, Pakistan: Frequency of Temporomandibular Joint Disorders. Journal of Islamic International Medical College (JIIMC). 2022 Sep 29;17(3):202-7.
10. Borges RE, Mendonça LD, dos Santos Calderon P. Diagnostic and screening inventories for temporomandibular disorders: A systematic review. CRANIO®. 2021 Jul 17:1-7.
11. Yap AU, Zhang MJ, Lei J, Fu KY. Diagnostic accuracy of the short-form Fonseca Anamnestic Index in relation to the Diagnostic Criteria for Temporomandibular Disorders. The Journal of Prosthetic Dentistry. 2022 Nov 1;128(5):977-83.
12. Valesan LF, Da-Cas CD, Réus JC, Denardin AC, Garanhani RR, Bonotto D, et al. Prevalence of temporomandibular joint disorders: a systematic review and meta-analysis. Clinical oral investigations. 2021 Feb;25:441-53.
13. Alshami M, Abdulbaqi H, Majeed A. Prevalence of Temporomandibular Disorder in Undergraduate Dental Students: A Questionnaire Based Study. Jordan Medical Journal. 2022 Oct 16;56(4).
14. Karabicak GO, Hazar Kanik Z. Temporomandibular disorder prevalence and its association with oral parafunctions, neck pain, and neck function in healthcare students: A cross-sectional study. CRANIO®. 2023 Jan 2;41(1):9-15.
15. Pedroni CR, De Oliveira AS, Guaratini MI. Prevalence study of signs and symptoms of temporomandibular disorders in university students. Journal of oral rehabilitation. 2003 Mar;30(3):283-9.
16. Karthik R, Hafila MF, Saravanan C, Vivek N, Priyadarsini P, Ashwath B. Assessing prevalence of temporomandibular disorders among university students: a questionnaire study. Journal of international society of preventive and community dentistry. 2017 Jun 1;7(Suppl 1): S24-9.
17. Zafar MS, Fareed WM, Taymour N, Khurshid Z, Khan AH. Self-reported frequency of temporomandibular disorders among undergraduate students at Taibah University. Journal of Taibah University medical sciences. 2017 Dec 1;12(6):517-22.
18. Khan SJ, Asif M, Aslam S, Khan WJ, Hamza SA. Pakistan's healthcare system: A review of major challenges and the first comprehensive universal health coverage initiative. Cureus. 2023 Sep 4;15(9).
19. Irfan SM, Ijaz A. Comparison of service quality between private and public hospitals: Empirical evidences from Pakistan. Journal of Quality and Technology Management. 2011 Jun;7(1):1-22.
20. Gawade KD, Vardharajulu G. Prevalance of correlation between temporomandibular dysfunction and occupational stress in white collar professionals. Journal of Health Research and Reviews (In Developing Countries). 2019 May 1;6(2):62-6.
21. Bueno CH, Pereira DD, Pattussi MP, Grossi PK, Grossi ML. Gender differences in temporomandibular disorders in adult populational studies: a systematic review and meta-analysis. Journal of oral rehabilitation. 2018 Sep;45(9):720-9.
22. Jedynak B, Jaworska-Zaremba M, Grzechocińska B, Chmurska M, Janicka J, Kostrzewa-Janicka J. TMD in females with menstrual disorders. International journal of environmental research and public health. 2021 Jul 7;18(14):7263.
23. Dalewski B, Kamińska A, Białkowska K, Jakubowska A, Sobolewska E. Association of estrogen receptor 1 and tumor necrosis factor α polymorphisms with temporomandibular joint anterior disc displacement without reduction. Disease Markers. 2020 Oct 12;2020.
24. Thompson PW. Financial Crisis and its Effect on Psychological Well-Being, Health, Satisfaction, and Financial Incapability; A Systematic Review. Pakistan Journal of Medical & Health Sciences. 2023 May 12;17(03):511-.Mufti M. Pakistan in 2023: A Year of Desperate Survival. Asian Survey. 2024 Mar;64(2):211-21.
25. Mori N, Miyanaka D, Tokita M, Kawada M, Sakakibara K, Hamsyah F, et al. Job demands and temporomandibular disorders: mediating and moderating effects of psychological distress and recovery experiences. Journal of occupational health. 2024 Jan;66(1):uiad001.