Review Article

PREVALENCE OF TEMPOROMANDIBULAR DISORDERS IN INDIA: A SYSTEMATIC REVIEW

Deshpande Saee[1], Pande Neelam[1], Torane Abhishek[1], Bhoyar Dheeraj[1], Ingle Shreyas[1]*

[1]Department of Prosthodontics, Ranjeet Deshmukh Dental College & Research Centre, Nagpur, India. drsaeedeshpande@gmail.com

Received: 04 March 2025; **Revised:** 16 May 2025; **Accepted:** 18 May 2025 https://doi.org/10.51847/UFcmSFXRTJ

ABSTRACT

Reviewing the epidemiological literature on the prevalence of temporomandibular dysfunction (TMD) in India is the goal of this systematic review. Using pre-established inclusion and exclusion criteria, a literature search was carried out for pertinent studies from a number of databases, including the National Library of Medicine's PubMed, SCOPUS, and Web of Science. The quality of a few chosen papers that fit the search criteria was assessed using the JBI tool, and the results were then compiled into tables. Data about the study population, the diagnostic technique utilized, the prevalence of TMD, and other pertinent findings were retrieved from a total of 25 studies. The prevalence of TMD was 35% overall, with the majority of the studies conducted on young students in India. The data showed a high degree of heterogeneity, indicating that TMD predominantly impacts women and is a serious and expanding illness in the population at large. The information that is now accessible highlights the necessity of conducting more study on the etiologic variables linked to TMD in order to put effective preventative measures into place.

Key words: TMD, Sub-luxation, Disc displacement, Clicking, Pain, Prevalence.

Introduction

Temporomandibular disorders (TMDs) are a broad category of conditions affecting the masticatory muscles, temporomandibular joints (TMJ), and associated tissues. These disorders are characterized by symptoms like joint pain, muscle tenderness, restricted jaw movement, and audible joint sounds (clicking or crepitation). TMDs significantly impact physical and mental health, leading to diminished quality of life and, in severe cases, long-term disability.

The causes of TMDs are multifaceted and classified into predisposing, initiating, and perpetuating factors. Biomechanical factors are issues such as malocclusion, parafunctional habits (e.g., bruxism and clenching), and postural imbalances that contribute to TMJ dysfunction. Psychosocial elements, including stress, anxiety, depression, and psychological disorders, exacerbate TMD symptoms, often leading to chronic pain syndromes. Systemic factors involve osteoarthritis, rheumatoid arthritis, and autoimmune disorders [1]. Genetic variations, such as those in COMT and ADRB2 genes, influence pain sensitivity and predispose individuals to chronic conditions [2]. Hormonal influences are seen particularly in women, which are linked due to TMD's greater incidence in women, emphasizing the role of estrogen and other hormones in joint health.

TMDs frequently coexist with other musculoskeletal and systemic conditions, including arthritis, migraines, fibromyalgia, chronic back pain, and irritable bowel syndrome. Symptoms like headaches, restricted jaw movement, and muscle discomfort are frequently reported and can significantly affect daily activities and overall well-being.

Epidemiological studies indicate wide variations in TMD prevalence, with estimates ranging from 5% to 60% globally [3]. Young adults and women of reproductive age represent high-risk groups due to hormonal, psychological, and lifestyle factors. Academic pressures, financial difficulties, and stress-inducing habits contribute to TMD prevalence among students, a particularly vulnerable demographic.

Clinical exams, Fonseca/self-developed questionnaires, and case history records are the primary diagnostic methods for TMDs. The 1992 introduction of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) offered a systematic method for classifying TMD into two parts: psychological (Axis II) and physical (Axis I). In 2014, the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) were introduced, providing improved diagnostic precision for research and clinical applications.

The contribution of dental factors to TMD remains a subject of debate. Malocclusion, occlusal interference, tooth loss, and ill-fitting prostheses are suspected risk factors. However, inconsistent evidence highlights the need for further research. Parafunctional habits like clenching and grinding, along with certain dental procedures [4-9], can exacerbate symptoms and warrant careful evaluation during treatment planning [10-15].

Evidence synthesis of literature available regarding TMD epidemiology in other countries has been published [2]. However, there have been very few available for India. Therefore, this systematic review was planned and carried out in order to respond to the study inquiry: What is the prevalence of TMDs in India?

Search strategy

An electronic search was conducted in PubMed, SCOPUS, Web of Science, and Google Scholar to locate relevant papers published up until December 31, 2024; the investigation was restricted to literature written in English. The search strategy in all databases was designed using controlled vocabulary (MeSH terms in PubMed) and free-text phrases in the titles and/or abstracts. The search strategies were accomplished using keywords based on each portion of the PO question, which were separated utilizing the Boolean operator OR and then combined employing the Boolean operator AND. The reference lists of the retrieved studies will also be searched. **Table 1** summarizes the search strategy developed.

Table 1. Search Strategy

Sr. No	Search Strategy
1	Temporomandibular Disfunction syndrome OR Temporomandibular disorder OR TMD
2	Indian Population OR Prevalence OR Incidence
9	1 AND 2

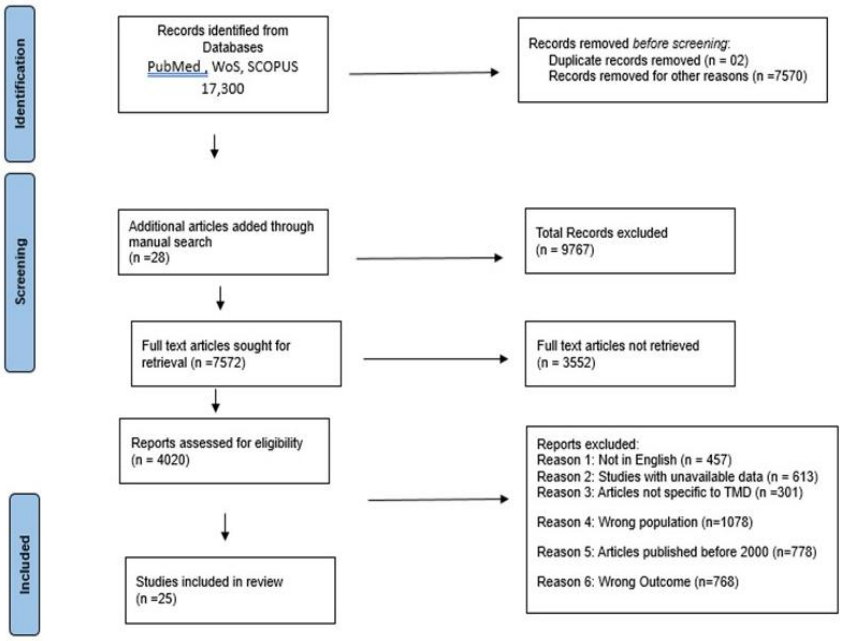

Figure 1. PRISMA flowchart

Table 2. Data extraction

Sno	Author/ year	Type of study	Region	Tool used	Study population	Prevalence	Findings
1	Rajesh Shetty *et al*. 2010 [16]	Cross sectional	Mangalore	Constructed questionnaire, Clinical examination	healthy, asymptomatic edentulous patients not wearing complete dentures	59%	Over half of the asymptomatic patients experienced TMD symptoms, but they had no idea of them; 59% of the subjects had at least one TMD symptom. TMDs were more common in women (62.5%) than in men (56.6%).
2	Amita Aditya *et al*. 2012 [17]	Cross-Sectional study5	Pune	Case history and constructed questionnaire, Clinical examination	Adults who are institutionalized or receiving outpatient care due to a psychosocial illness diagnosis	subjective TMD symptoms to be 12%, objective TMD symptoms present in 19.5% of participants	Patients with psychosocial issues do not seem to have an abnormally high frequency of TMJ dysfunction symptoms. Despite the fact that there is considerable comorbidity between these two illnesses, no obvious connection could be found.

3	Priyanka Modi *et al*. 2012 [18]	Cross sectional	Loni	Fonseca questionnaire	Medical and dental students	45.16%	This student group had a significant frequency of TMD; nevertheless, the majority of illnesses were moderate. There was no analytically substantial correlation between TMD intensity and sexuality.
4	Saraswati K. Gopal *et al*. 2014 [19]	Cross sectional	Chennai	Case history and constructed questionnaire, Clinical examination	Patients in Private dental college	60%	Since there was no discomfort, several of the asymptomatic individuals were unaware of the underlying issue with their TMJ.
5	Kaberi Majumder *et al*. 2015 [20]	Cross sectional study	Gurgaon	Helkimo anamnestic index (Ai) and clinical dysfunction index (Di)	Student in 5 different colleges	64.4%	TMD was highly prevalent among students and was strongly linked to anxiety and sadness.
6	Asawa *et al*. 2015 [21]	Cross-Sectional study	Dungarpur District	clinical examination according to WHO proforma	General population	21.4%	Men were more impacted than women, and TMJ signs and symptoms were more common in the 45–54 age range. TMJ symptoms were substantially correlated with skeletal fluorosis (33.0%).
7	Jivnani *et al*. 2017 [22]	Cross sectional	Lucknow	DC/TMD, hospital anxiety and depression scale (HADS), T-Scan	Student in Private dental college	17%	TMD was significantly correlated with both functional occlusal measures and psychological factors.
8	Ahuja *et al*. 2018 [23]	cross sectional study	Gaziabad	Clinical evaluation and questionnaire along with perceived stress scale (PSS).	Students in Private dental college	30.6%	One important etiologic factor that contributes to the development and maintenance of TMDs in dentistry students is stress. The age range of 21 to 25 years old was shown to have the highest prevalence of TMDs, with MPDS predominating. Females had the highest incidence of disc displacement (66.0%) and were shown to have a greater prevalence of TMDs than males.
9	Reshmi *et al*. 2018 [24]	Cross sectional	Kozhikode	Helkimo index Clinical examination	Partially edentulous patients in OPD of dental college	57.4%	TMD was more common in women than in men, and it was more common in individuals with Kennedy's class I mandibular condition and a combination of maxillary class I and mandibular class II situations. Although TMD symptoms decreased with age, the difference was not statistically significant.
10	Banerjee *et al*. 2019 [25]	Cross sectional	Lucknow	Self-reported questionnaire	Dental students in private dental college	30%	The most often reported symptoms among the students were TMJ sound, headache, and earache.

11	Dr. Preeti Nair *et al*. 2018 [26]	Cross sectional	Bhopal	Case history and constructed questionnaire , Clinical examination	Patients visiting Private dental college	55.3%	The results of this study indicated that younger people, particularly women, were at a higher risk of getting TMDs. Overstretching when yawning (31%), parafunctional behaviors (34%), jaw trauma (23%), dental treatment (8%), and traumatic dental treatment (4%) were factors that contributed to TMD.
12	Sandhya Jain *et al*. 2018 [27]	Cross sectional	Indore	Fonseca's Questionnaire	Patients under orthodontic treatment in dental college	25.3%	In the age group of 19 to 30, a considerably higher proportion of girls than men presented with TMDs. Age-related increases in TMD prevalence are also seen.
13	Pradeepta Kaushal *et al*. 2018 [28]	Cross sectional study	Indore	Case history and constructed questionnaire, Clinical examination Helkimo Index	Student in Private dental college	18.6%	Stress showed a highly significant value and was the primary cause for TMD. The most common sound found was clicking, and the affected muscle was the lateral pterygoid (27%), showing prevalence in females.
14	Pooja Bhave *et al*. 2019 [29]	Cross sectional	Navi-Mumbai	RDC/TMD	Student in Private dental college	51%	It is possible that symptoms do not always accompany the indicators of TMDs. Prior to signs appearing, patients can remain asymptomatic for an extended length of time.
15	Thomas *et al*. 2020 [30]	Cross sectional	Central kerala	Case history and constructed questionnaire, Clinical examination	Students from professional colleges	48%	The current investigation in professional institutions found that TMD was more common in men.
16	Varsha Ushakar *et al*. 2020 [31]	cross sectional study	Ernakulam	Fonseca questionnaire	Students in Private dental college	59.3%	Age has been shown to have a substantial impact on the severity of TMD, but the individual's sex had no discernible effect.
17	Swapna Bettanapalya Venkatesh *et al*. 2021 [32]	Cross sectional	Manipal	RDC/TMD Perceived Stress Scale (PSS) questionnaire	Student in Private dental college	30.7%	Substantial correlation between stress, TMDs, and salivary cortisol levels.
18	Kumari Sonam Jha *et al*. 2021 [33]	Cross sectional study	Jharkhand	Case history and constructed questionnaire, Clinical examination	Patient in Private dental college	1.25%	According to the factors that were examined, clicking was the most prevalent symptom. Incidence of TMD decreases as the age of an individual advances. More common in females compared to males,
19	Ajay Kumar *et al*. 2021 [34]	cross sectional study	Mangalore	RDC/TMD criteria.	Professional swimmers	13.54 %	Competitive swimmers are prone to TMDs. TMD was linked to more than an hour of practice per day and more than five days of practice. TMD was more common among swimmers who used the backstroke.

20	Munazza *et al*. 2020 [35]	Comparative Study	Mangalore	Fonseca's Anamnestic index and Zung's Self-rating Anxiety Scale.	Students in Private dental college	46%	Preclinical students had a larger percentage of stress, whereas clinical students had a higher percentage of TMD. The degree of stress was significantly correlated with TMD. Compared to male students, the prevalence and severity of TMD were greater among female students.
21	Sanjana Devi *et al*. 2021 [36]	Retrospective study	Chennai	Previous data, case history	Patients in Private dental college	0.8%	Disc displacement was more prevalent and TMD was more prevalent in men. And the age range of 30 to 39 was the most impacted.
22	Jayant Prakash *et al*. 2022 [37]	cross-sectional study	Muzaffarpur	Case history and constructed questionnaire, Clinical examination	Patients in Private dental college	35.7% of the elderly population	More females were affected compared to males. Subjects who reported bruxism had a significantly higher prevalence of TMD symptoms.
23	Jaishankar *et al*. 2023 [38]	Cross sectional	India	online questionnaire	Musicians and vocalist	50.8%	Playing an instrument raises the likelihood of acquiring TMD, and playing the wind instrument puts one at greater risk.
24	Ramachandran *et al*. [39] 2023	Cross-sectional Study.	Pondicherry	Case history records	Patients in Private dental college	1%	Women were more likely than males to report having TMJ discomfort. Joint noises and discomfort were the most often reported symptoms.
25	Chinthalapalli *et al*. 2024 [40]	Cross-sectional Study	Davangere	DC-TMD	Dental students	61.2 %.	TMDs are more likely to occur among dental students, especially those participating in clinical programs, and are closely associated with increased stress levels.

Table 3. Data Extraction

Cochran's Q	df	P	I^2	Tau Squared (T^2)
220.129	24	0	89.097%	0.041

Table 4. Statistical Analysis using random effects model

Prevalence	Raw Prevalence	SE of transformed Prevalence	Variance	Weight	Normal Approximation interval	
					Lower Bound	Upper Bound
0.35923	0.35923	0.01422	0.0002	4946.89545	0.33136	0.38709

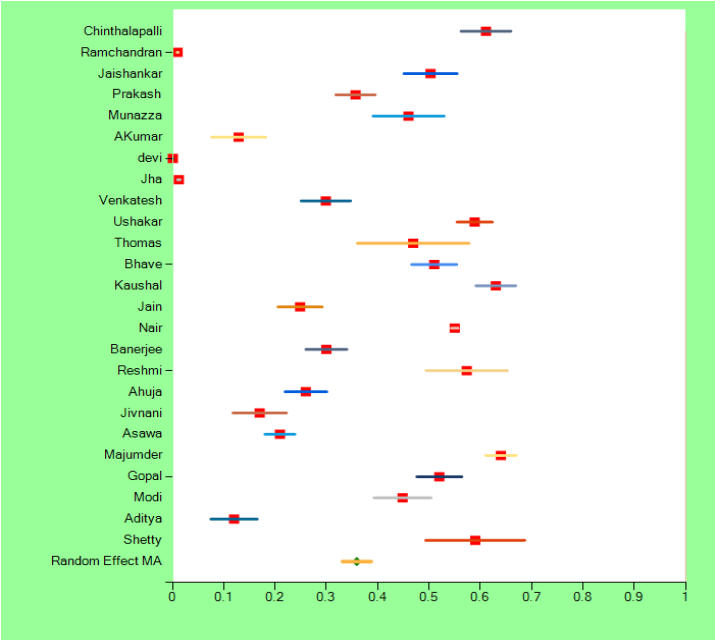

Figure 2. Forest Plot

Publication bias was assessed using LFK index the value was 13.699 indicating high publication bias.

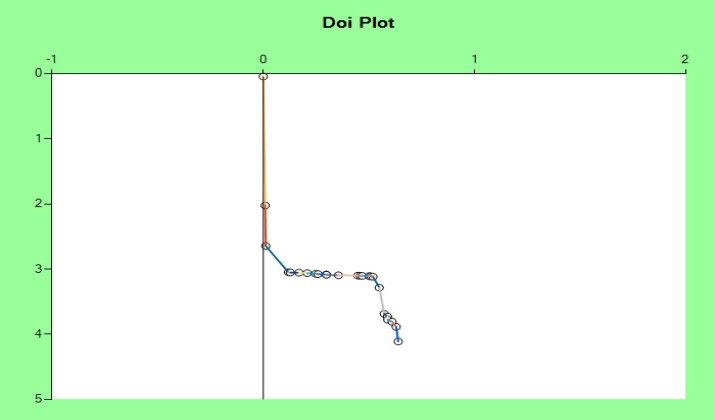

Figure 3. Doi Plot for publication bias

Table 5. Quality assessment of the studies included in the systematic review

SN	Study	Were the requirements to be included in the sample well-defined?	Were the research participants and environment thoroughly explained?	Were the measurements of exposure accurate and legitimate?	Were the conditions measured using unbiased, accepted standards?	Have complicating variables been discovered?	Were methods for handling complicating variables mentioned?	Were the measurements of the results accurate and legitimate?	Was suitable analytical assessment applied?	Score	Quality
1	Shetty R *et al.* 2010	Y	N	Y	Y	N	N	N	Y	0.5	Moderate
2	Aditya A *et al.* 2012	Y	N	Y	Y	N	N	Y	Y	0.6	Moderate

3	Modi P *et al.* 2012	Y	N	N	N	N	N	N	Y	0.3	Low
4	Gopal SK *et al.* 2014	Y	N	Y	Y	N	N	Y	Y	0.6	Moderate
5	Majumder K *et al.* 2015	Y	Y	Y	Y	N	N	Y	Y	0.8	High
6	Asawa K *et al.* 2015	Y	Y	Y	Y	N	N	Y	Y	0.8	High
7	Jivnani HM *et al.* 2017	N	N	Y	Y	N	N	N	Y	0.4	Moderate
8	Ahuja V *et al.* 2018	N	N	Y	Y	N	N	Y	Y	0.5	Moderate
9	Reshmi M *et al.* 2018	Y	N	Y	Y	N	N	Y	Y	0.6	Moderate
10	Banerjee A *et al.* 2019	N	N	N	N	N	N	N	Y	0.1	Low
11	Nair P *et al.* 2018	N	N	Y	Y	N	N	Y	Y	0.5	Moderate
12	Jain S et al. 2018	Y	N	N	N	N	N	Y	Y	0.4	Moderate
13	Kaushal P *et al*. 2018	Y	N	Y	Y	N	N	Y	Y	0.6	Moderate
14	Bhave P *et al*. 2019	Y	N	Y	Y	N	N	Y	Y	0.6	Moderate
15	Thomas AS *et al*. 2020	N	N	N	N	N	N	N	Y	0.1	Low
16	Ushakar V *et al*. 2020	N	N	N	N	N	N	N	Y	0.1	Low
17	Venkatesh SB *et al*. 2021	Y	N	Y	Y	N	N	Y	Y	0.6	Moderate
18	Jha KS *et al*. 2021	Y	N	Y	Y	N	N	Y	Y	0.6	Moderate
19	Kumar A *et al*. 2021	Y	Y	Y	Y	N	N	Y	Y	0.8	High
20	Munazza S *et al*. 2024	Y	Y	N	N	N	N	N	Y	0.4	Moderate
21	Devi S *et al*. 2021	Y	Y	UC	UC	Y	N	UC	Y	0.5	Moderate
22	Prakash J *et al*. 2022	Y	Y	Y	Y	N	N	Y	Y	0.8	High
23	Jaishankar HP *et al*. 2023	Y	Y	N	N	N	N	N	Y	0.4	Moderate
24	Ramachandran S 2023	Y	Y	N	N	N	N	Y	Y	0.5	Moderate
25	Chinthalapalli SJ *et al*. 2024	Y	Y	Y	Y	N	N	Y	Y	0.7	High

Y: Yes, N: No; UC: Unclear

The Joanna Briggs Institute (JBI) analytical cross-sectional study methodology was employed to assess the quality of the contained research. Scores of 1 for "Yes" and "Not useful," 0 for "No," and "Unclear" were given to each research after it was examined separately. The cumulative score assigned to each question was divided by the maximum achievable score, i.e. eight. If the scores were in the range of 0 to 0.3, the studies were considered as low quality; scores between 0.4 to 0.6 as moderate quality, whereas studies with scores between 0.7 to 1.0 were considered as high quality. This review comprised five high-quality studies, sixteen moderate-quality studies, and four low-quality studies.

Results and Discussion

The total prevalence of TMDs was 35%. The majority of studies on dentistry students were conducted in colleges and hospitals. The majority of the studies were cross-sectional. These investigations were mostly conducted in south India, then central India, and finally north India. There was no research reported from India's northeast area [41-44]. The majority of TMD cases were recorded using a self-developed questionnaire, case history, and clinical examination, although the questionnaire's validity was lacking due to its unstructured nature. Six writers assessed TMD using the Fonseca questionnaire, whereas five authors utilized the DC/TMD criteria. When all studies' data were examined, they revealed a similar female predisposition, with the clicking sound being the most prevalent TMD symptom. Disc derangement with/without decrease was the least prevalent. Almost all studies looked at overall TMD prevalence rather than specific types of TMD.

Conclusion

The pooled prevalence of temporomandibular disorders (TMDs) among dental students is 35%. The absence of standardized diagnostic tools in most studies restricted the reliability of their findings. Geographically inclusive studies are needed, as research has mostly focused on southern regions and there is a lack of data from northeastern India. A consistent female preference and joint clicking as the predominant symptom were noted. Future studies ought to focus on standardized diagnostic criteria and explore the specific subtypes of TMDs to enhance understanding of their distribution and contributing factors.

Future directions

Despite growing awareness of TMD as a significant health

concern, challenges such as inconsistent diagnostic criteria and research variability persist. A deeper understanding of the interplay between genetic, systemic, and mechanical factors is essential for developing effective preventive and therapeutic strategies. To assure impartial findings in our nation, more research with high-quality designs, such as case-control and long-term cohort studies, utilizing standardized diagnostic methodologies and tools, such as DC TMD criteria, should be conducted with large sample sizes. The findings of such big, well-conducted, population-based research will help to address certain etiological variables more effectively.

Acknowledgments: None

Conflict of interest: None

Financial support: None

Ethics statement: None

References

1. Tabassum M, Ayub F, Tanveer K, Ramzan M, Bukhsh A, Mohammed ZM, et al. Quality-of-life assessment in musculoskeletal disorder patients, Lahore, Pakistan. Bull Pioneer Res Med Clin Sci. 2023;2(1):17-24. doi:10.51847/QVOwcxjCwX
2. Ryan J, Akhter R, Hassan N, Hilton G, Wickham J, Ibaragi S. Epidemiology of temporomandibular disorder in the general population: a systematic review. Adv Dent Oral Health. 2019;10(3):1-3.
3. Trivedi A, Agarwal S, Gupta I, Goswami R, Mowar A. A comparative evaluation of malocclusion and associated risk factors in patients suffering with temporomandibular disorders: a systematic review and meta-analysis of observational studies. Eur J Gen Dent. 2022;11(3):149-57.
4. Ansari S, Alshamrani B, Alzahrani A, Alfayez A, Alhebshan N, Alshamrani A. Prevalence of dental fluorosis among teenagers; a cross-sectional study in the schools of riyadh. Bull Pioneer Res Med Clin Sci. 2022;1(1):13-7. doi:10.51847/37FuXGVEpm
5. Mahmood H, Shahid AM, Usama M, Nadeem E, Zafar N, Bashir R. Knowledge and perception of periodontal-systemic interactions among dental professionals. Ann Orthod Periodontics Spec. 2022;2:23-8. doi:10.51847/BbcDtqLmI1
6. AlHussain BS, AlFayez AA, AlDuhaymi AA, AlMulhim EA, Assiri MY, Ansari SH. Impact of different antibacterial substances in dental composite materials: a comprehensive review. Int J Dent Res Allied Sci. 2022;2(1):1-7. doi:10.51847/jg2xu2PbJK
7. Shahzan S, Paulraj J, Maiti S. Impact of rubber dam use on anxiety levels in children during dental procedures: a randomized controlled study. Int J Dent Res Allied Sci. 2023;3(1):17-23. doi:10.51847/RmzKyVOff6
8. Alnemer S, Alajlan AM, Alqarni AN, Alshanbari SH, Alhejazi MA, Matrood MA, et al. Knowledge and practices of riyadh-based dentists in managing traumatic dental injuries. Ann J Dent Med Assist. 2022;2(1):22-5. doi:10.51847/ZGZXIiiSUR
9. Kumar D, Gurunathan D, Jabin Z, Talal S. Comparative efficacy of aromatherapy and conscious sedation in pediatric dental anxiety management. Ann J Dent Med Assist. 2022;2(1):14-21. doi:10.51847/TVRFhVaiIQ
10. Mei L, Jiang L. Factors influencing post-treatment relapse in diastema closure. Asian J Periodontics Orthod. 2022;2:51-5. doi:10.51847/5BKHDdH8UU
11. Sugimori T, Yamaguchi M, Kikuta J, Shimizu M, Negishi S. The biomechanical and cellular response to micro-perforations in orthodontic therapy. Asian J Periodontics Orthod. 2022;2:1-15. doi:10.51847/Z9adSJ59rj
12. Zhang X, Wu X, Cao J, Guo N, Bo H, Ma Y, et al. Investigating factors affecting the length of patients' stay in hospitals. J Integr Nurs Palliat Care. 2022;3:26-30. doi:10.51847/FLasQgumnS
13. Vogel JP, Nguyen P, Ramson J, Silva MSD, Pham MD, Sultana S, et al. Studying the effectiveness of various treatment methods effective on postpartum hemorrhage. Bull Pioneer Res Med Clin Sci. 2023;2(2):20-6. doi:10.51847/P4KETj5Mik
14. Roy PK, Lalchuangkima F, Gupta B, Zonuntluangi Z, Laldinchhana L, Lalhlenmawia H, et al. Green synthesis of silver nanoparticles with picrasma javanica extract shows enhanced wound healing in wistar rats. Bull Pioneer Res Med Clin Sci. 2023;2(1):35-48. doi:10.51847/6wXPZcGzxu
15. Al-Twaijri SA, AlKharboush GH, Alohali MA, Arab IF, Alqarni RH, Alharbi MS. Application of lasers for soft tissues in orthodontic treatment: a narrative review. Bull Pioneer Res Med Clin Sci. 2024;3(1):1-6.
16. Shetty R. Prevalence of signs of temporomandibular joint dysfunction in asymptomatic edentulous subjects: a cross-sectional study. J Indian Prosthodont Soc. 2010;10(2):96-101. doi:10.1007/s13191-010-0018-9
17. Aditya A, Lele S, Aditya P. Prevalence of symptoms associated with temporomandibular disorders in patients with psychosocial disorders. J Int Dent Med Res. 2012;5(1):26-9.
18. Modi P, Shaikh SS, Munde A. A cross-sectional study of prevalence of temporomandibular disorders in university students. Int J Sci Res Publ. 2012;2(9):1-3.
19. Gopal SK, Shankar R, Vardhan HB. Prevalence of temporo-mandibular joint disorders in symptomatic and asymptomatic patients: a cross-sectional study. Int J Adv Sci. 2014;1(6):14-20.
20. Majumder K, Sharma S, Rao JKD, Siwach V, Arya V, Gulia S. Prevalence and sex distribution of temporomandibular disorder and their association with anxiety and depression in Indian medical university students. Int J Clin Med. 2015;6(8):570-8.
21. Asawa K, Singh A, Bhat N, Tak M, Shinde K, Jain S. Association of temporomandibular joint signs &

symptoms with dental fluorosis & skeletal manifestations in endemic fluoride areas of Dungarpur district, Rajasthan, India. J Clin Diagn Res. 2015;9(12):ZC18.
22. Jivnani HM, Tripathi S, Shanker R, Singh BP, Agrawal KK, Singhal R. A study to determine the prevalence of temporomandibular disorders in a young adult population and its association with psychological and functional occlusal parameters. J Prosthodont. 2017;28(1):e445-9.
23. Ahuja V, Ranjan V, Passi D, Jaiswal R. Study of stress-induced temporomandibular disorders among dental students: an institutional study. Natl J Maxillofac Surg. 2018;9(2):147-54.
24. Reshmi M, Vinni TK, Vasunni GK, Kumar PA, Reshmi RS. Prevalence of temporomandibular disorders among partially edentulous patients: a hospital based cross-sectional study. IOSR J Dent Med Sci. 2018;17(4):23-7.
25. Banerjee A, Kumar SG, Misra N, Deepak U, Upadhyay D, Verma S. Self-assessment of temporomandibular disorder (TMD) symptoms prevailing among dental students. J Adv Med Dent Scie Res. 2019;7(1):17-20.
26. Nair P, Hegde K, Chatterjee R, Srivastava H, Lalwani R, Patel R. Prevalence of types of temporomandibular disorders among the dental OPD patients - a cross-sectional study. IOSR J Dent Med Sci. 2018;17(2):27-31.
27. Jain S, Chourse S, Jain D. Prevalence and severity of temporomandibular disorders among the orthodontic patients using Fonseca's questionnaire. Contemp Clin Dent. 2018;9(1):31-4.
28. Kaushal P, Saha MK, Pandey P, Kakrani J. Prevalence of temporomandibular disorders in dental students: a survey in Indore city. Int J Appl Dent Sci. 2018;4(1):273-7.
29. Bhave P, Nadgere J, Ram S, Iyer J. Prevalence of the signs and symptoms of temporomandibular joint disorders among dental students in Navi Mumbai. J Contemp Dent. 2019;9(3):114.
30. Thomas AS, Philip AH, Oommen P. Prevalence of temporomandibular joint disorder among professional students in Central Kerala. IOSR J Dent Med Sci. 2020;19(11):1-5.
31. Ushakar V, Paul J, D'Lima JP, Parackal ST, Thomas D, Roy JS. Determination of prevalence of temporomandibular disorders among dental students in Ernakulum district–a cross-sectional study. IP Int J Periodontol Implantol. 2020;5(4):154-8.
32. Venkatesh SB, Shetty SS, Kamath V. Prevalence of temporomandibular disorders and its correlation with stress and salivary cortisol levels among students. Pesqui Bras Odontopediatria Clín Integr. 2021;21:e0120.
33. Jha KS, Gupta A, Deepak D, Singh A. Prevalence of temporomandibular joint disorders in patients visiting to a dental hospital in Jharkhand. Int J Recent Sci Res. 2021;12(1):40640-3.
34. Kumar A, Dharan A, Pradhan DK. Prevalence of temporomandibular joint disorders in competitive swimmers: a cross-sectional study. Indian J Phys Educ Sports. 2021;8(1):87-92.
35. Sharfuddin M, Muralidharan A, Shetty P, Nandan A, Jain A. Stress related temporomandibular joint disorders-a comparative study between preclinical and clinical undergraduate students of dentistry. Indian J Forensic Med Toxicol. 2020;14(4):4306-10.
36. Devi S, Duraisamy R. Prevalence of temporomandibular disorders and assessment of factors associated with it - A retrospective study. Int J Dent Oral Sci. 2021;8(8):3871-6.
37. Prakash J, Ranvijay K, Devi LS, Shenoy M, Abdul NS, Shivakumar GC, et al. Assessment of symptoms associated with temporomandibular dysfunction and bruxism among elderly population: an epidemiological survey. J Contemp Dent Pract. 2022;23(4):393-8.
38. Jaishankar HP, Patil K, Sanjay CJ, Shiny A, Sharath N, Bharadwaj B. Assessment of the prevalence of temporomandibular joint disorder among vocalists and musicians using a questionnaire study. Med Sci. 2023;27:e84ms2825.
39. Ramachandran S, Ravichandran K. Prevalence of temporomandibular joint pain among patients who reported to dental OPD at a tertiary hospital in Pondicherry, India: a cross-sectional study. J Clin Diagn Res. 2023;17(11):ZC40-7.
40. Chinthalapalli ST, Sapna B, Gujjar VR, Sulthana DG, Chalamala NS, Neha NC, et al. Prevalence of temporomandibular joint disorders and its association with stress among dental students in Davangere city – a cross-sectional survey. J Acad Dent Educ. 2024;10(2):1-5.
41. Reshetnikov AD, Barashkova AI. The role of veterinary innovations in reindeer husbandry for climate change adaptation. Int J Vet Res Allied Sci. 2022;2(1):1-8. doi:10.51847/UlrjooXH9s
42. Abdelmuhsin AA, Alghamdi AA, Ibrahim NA. Evaluating the phenotypic and genotypic diversity of plantago ciliate in the Ha'il Region, Saudi Arabia. Int J Vet Res Allied Sci. 2022;2(1):15-23. doi:10.51847/Qd2C6vFTgc
43. Zuev RV. A Comprehensive checklist with annotations of millipedes (myriapoda: diplopoda) in the Stavropol Territory, Northern Caucasus, Russia. Entomol Lett. 2022;2(1):19-27. doi:10.51847/fEjYpJ0vuT
44. Khan S, Bibi M, Akbar B, Ahmad N, Ahmad W, Rehman A. A faunistic survey of dragonfly species (Anisoptera; Odonata) in Babuzai, including new records for the Swat district, Pakistan. Entomol Lett. 2023;3(2):44-51. doi:10.51847/I2fM8yR3wi