Temporomandibular Disorders and Their Association with Gender and Psychosocial Factors Among Adults: A Narrative Review

Jasem Ahmad Alburaih[1,2], Lara Ali Al-Atyar[3], Hassan Ali Almohsen[1], Abduljalil Khamis Almeshal[1], Mohammed Ali Ameer[4], Ali Mahdi Alshakhes[1], Salih Mohammed Aljasem[4], Abdulmohsen Eissa Aleissa[1], Mohammed Hussain Alabbad[1] and Mudaher Habeb Alhamoud[1]

[1]Department of Dentistry, Eastern Sector, Al-Ahsa Health Cluster, Al-Ahsa, Saudi Arabia
[2]Baheth Association for Health Research, Executive Directorate, Riyadh, Saudi Arabia
[3]Department of General Dentistry, The Egyptian Ministry of Health, Cairo, Egypt
[4]Department of Dentistry, Northern Sector, Al-Ahsa Health Cluster, Al-Ahsa, Saudi Arabia

Correspondence to:
Jasem Ahmed Alburaih,
Jasemalburaih@baheth.org.sa

Additional material is published online only. To view please visit the journal online.

Cite this as: Alburaih JA, Al-Atyar LA, Almohsen HA, Almeshal AK, Ameer MA, Alshakhes AM, Aljasem SM, Aleissa AE, Alabbad MH and Alhmoud MH. Temporomandibular Disorders and Their Association with Gender and Psychosocial Factors Among Adults: A Narrative Review. Premier Journal of Dentistry 2025;3:100005

DOI: https://doi.org/10.70389/PJD.100005

Peer Review
Received: 5 August 2025
Last revised: 30 August 2025
Accepted: 30 August 2025
Version accepted: 2
Published: 10 September 2025

Ethical approval: N/a
Consent: N/a
Funding: No industry funding
Conflicts of interest: None

ABSTRACT

Temporomandibular disorders (TMDs) have become a prevalent health problem worldwide. TMDs are associated with several pain-related issues affecting the quality of life of many populations. Although several studies have investigated the etiology of TMDs, the exact cause remains unclear since many factors contribute to these disorders, including muscle and nerve coordination, mechanical factors, genetics, psychological factors, and environmental factors. Furthermore, research shows that TMDs are more common among women. Additionally, these conditions are linked to increased stress levels, anxiety, and lower socioeconomic status (SES). Diagnostic methods for TMDs primarily rely on examinations and imaging techniques, thereby improving diagnostic accuracy and guiding the development of an effective treatment plan. The classification system recommended by the International Research Diagnostic Criteria for Temporomandibular Dysfunction Consortium Network stands as an effective tool for categorizing cases with TMDs, developing specific treatment plans, and predicting outcomes. This narrative review summarizes the current knowledge on the prevalence, etiological factors, symptoms, types, screening, and diagnostic methods of TMDs among adults, while exploring the associations between TMDs and stress, gender, and SES.

Keywords: DC, Fonseca anamnestic index screening, Gender-linked TMD prevalence, Psychosocial stress associations, Socioeconomic risk factors, TMD diagnostic criteria

Background

The temporomandibular joint (TMJ) represents one of the most complicated joints in the body. There are two TMJs, and each one has a capsule that covers its articular cartilage, the synovial cavity, ligaments, and the synovial fluid. The TMJ is formed between the mandibular condyle and the temporal bone.[1]

The public has become more aware of temporomandibular disorders (TMDs), which have lately been identified as relatively common conditions.[2] The term "TMDs" encompasses a broad spectrum of conditions affecting the masticatory muscles and associated structures.[3] TMDs often induce some signs, including muscle pain, clicking sounds, restrictions or deviations in the mandibular movements, and related migraines.[4]

The prevalence of TMDs has received continuous and broad attention. However, interpreting findings across the literature remains challenging due to variations in examiner expertise, inconsistent conclusions, and potential research bias.[5]

The particular etiology of TMDs has long been debated, leading many to postulate a complex explanation.[6] Orofacial pain symptoms are highly prevalent in the adult population, according to epidemiological studies carried out in several countries, including the United States, Sweden, the Netherlands, Finland, Pakistan, India, Italy, Iran, Denmark, Brazil, the United Kingdom, and Canada. It is estimated that 5–60% of people suffer from one or more symptoms of TMDs.[7,8]

The current review examines the existing literature to evaluate several aspects related to TMDs, including prevalence, etiology, symptoms, types, classification, screening, and diagnostic methods, while also exploring the correlation between TMDs and gender, emotional stress, and socioeconomic status (SES).

Materials and Methods

Search Strategy and Study Selection

We initially conducted the literature search in August 2024 and then updated it in July 2025, employing a search strategy tailored for the PubMed database (Table 1). Additionally, we used Boolean operators OR/AND to combine terms related to TMDs and their associated factors. We then identified search terms and synonyms from the Medical Subject Headings (MeSH) database and relevant literature, including:

"Temporomandibular disorders," "TMDs," "temporomandibular joint dysfunction," "TMJ disorders," "gender differences," "sex differences," "stress," "psychological factors," "anxiety," "depression," "socioeconomic status," "SES," "income," "education."

Additionally, the research team tested alternative keywords, but no additional relevant studies were found. We applied several filters, including human studies, the English language, and publications between 2010 and 2025.

Eligibility Criteria for the Selected Studies

Inclusion Criteria

1. Peer-reviewed scholarly articles and publications (observational studies, clinical trials, high-quality narrative, or systematic reviews).
2. Studies or publications addressing at least one of the factors associated with TMDs, such as gender differences, psychological factors/stress, and SES.
3. Articles published in English between 2010 and 2025.

Author contribution:
Jasem Ahmed Alburaih and Lara Ali Al-Atyar contributed to the review by drafting the abstract, background, and conclusion while critically revising all other sections of the review. Hassan Ali Almohsen conducted detailed research on the etiology of TMD and authored the corresponding section. Abduljalil Khamis Almeshal researched evidence-based studies on TMD prevalence and composed this section. Mohammed Ali Ameer researched and authored the section addressing the association between TMD and emotional stress. Ali Mahdi Alshakhes contributed by drafting the sections on TMD symptoms and classification. Salih Mohammed Aljasem authored the sections on diagnostic and screening methods for TMD, supported by an extensive review of current methodologies. Abdulmohsen Eissa Aleissa contributed to the sections on TMD symptoms and screening methods. Mohammed Hussain Alabbad authored the section exploring the association between TMD and gender. Mudaher Habeb Alhamoud researched the relationship between TMD and socioeconomic factors, drafting the relevant section. All authors reviewed and approved the final version of the review – Conceptualization, Writing – original draft, review and editing

Guarantor: Jasem Ahmed Alburaih

Provenance and peer-review: Unsolicited and externally peer-reviewed

Data availability statement: N/a

Exclusion Criteria

1. Publications unrelated to the topic of interest.
2. Studies or publications in a language other than English or outside the selected publication period (2010–2025).
3. Conference abstracts without full-text availability.

Two reviewers (J. A. Alburaih and L. A. Al-Atyar) independently screened titles and abstracts to assess eligibility (Figure 1). When the information included in the titles and abstracts was insufficient, the full text was retrieved for thorough evaluation. We resolved disagreements through discussion until reaching a consensus. We obtained all eligible publications and articles either directly from the database or by emailing the corresponding authors. Studies that remained inaccessible after five email attempts were excluded from the review. In cases of disagreement regarding study eligibility, a third reviewer (H. A. Almohsen) served as an adjudicator. When multiple versions of the same eligible review were available, only the most recent version was included.

Table 1| Search strategy employed in the pubmed database

Database	Search Strategy
PubMed	("temporomandibular disorders"[Title/Abstract] OR "TMD"[Title/Abstract] OR "temporomandibular joint dysfunction"[Title/Abstract]) AND ("gender differences"[Title/Abstract] OR "sex differences"[Title/Abstract] OR male[Title/Abstract] OR female[Title/Abstract]) AND ("stress"[Title/Abstract] OR "psychological factors"[Title/Abstract] OR anxiety[Title/Abstract] OR depression[Title/Abstract]) AND ("socioeconomic status"[Title/Abstract] OR SES[Title/Abstract] OR income[Title/Abstract] OR education[Title/Abstract])

Data Extraction

For the literature review, two reviewers (J. A. Alburaih and L.A. Al-Atyar) collected relevant information from key studies of each theme. The collected data included the authors, year of publication, design, sample size, main findings, and limitations. If any necessary data were missing, the corresponding authors were contacted by email.

Etiology of TMDs

The etiology of TMDs is still poorly understood, complicating its diagnosis and management.[9] These disorders have a complex, multifactorial etiology that involves biological (neuromuscular, biomechanical, genetic), psychological, environmental, social, and systemic factors[9–13] and genetic factors.[14,15]

These factors may be classified as predisposing, initiating, and perpetuating factors based on their influence on the disease progression.[9] Predisposing factors

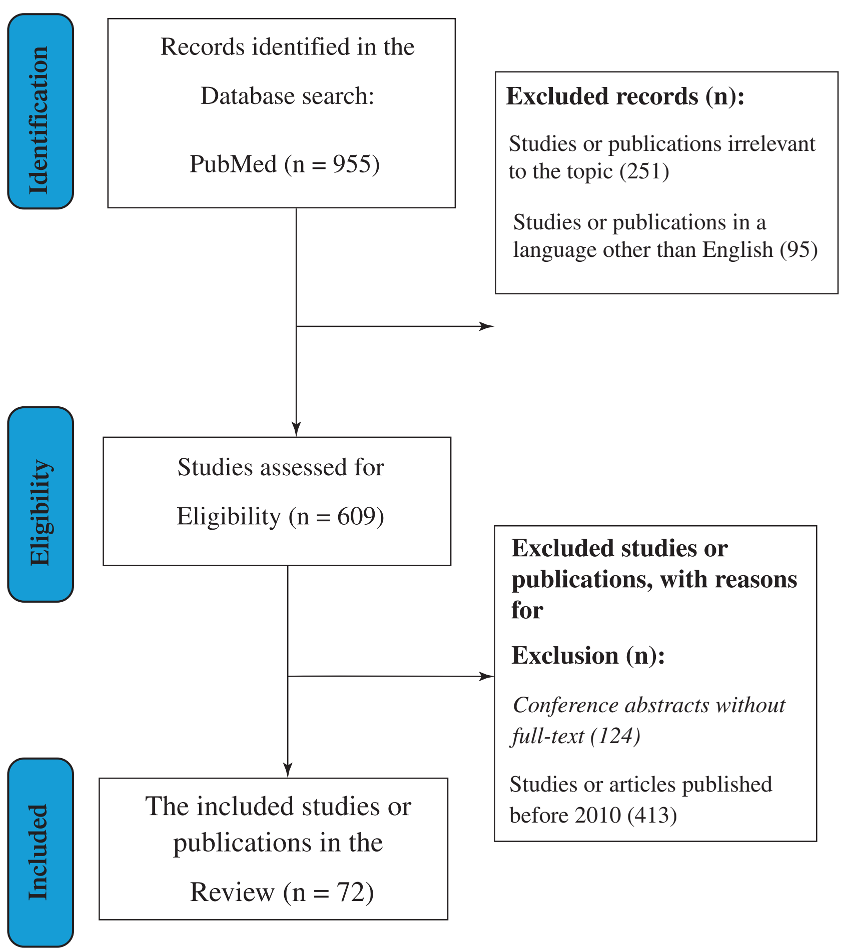

Fig 1 | A flowchart illustrating the bibliographic search process for the review heighten the risk for TMDs, encompassing structural, pathophysiological, or psychological mechanisms that alter the masticatory system.[9,16] Examples include occlusal abnormalities/overloading, parafunctional habits (bruxism), orthodontic treatment, orthopedic instability, joint laxity, exogenous estrogen, and trauma.[13,17,18]

Initiating factors trigger the onset of the disorder, which typically involve adverse loading of the masticatory system and trauma.[9] Health conditions, such as osteoporosis, have also been found to affect the bone, thus increasing the risk for TMDs.[19]

Perpetuating factors sustain the disorder by hindering the healing process or enhancing its progression.[9] These factors may involve behavior (head posture, grinding, and clenching), cognitive factors, and emotional factors like anxiety and depression.[13,18,20]

These factors provide a lens for viewing the multifactorial etiology of TMDs, indicating that these disorders are not often associated with a single factor.[9] For instance, psychological factors, including high anxiety levels and exposure to stressful events, may contribute to the etiology and persistence of TMDs.[21–23]

Moreover, TMDs are induced by a complex interaction of all these factors, including biological, psychological, and social factors.[9,24]

In addition, numerous conditions, such as autoimmune disorders, sleep apnea, fibromyalgia, psychiatric illness, and other pain conditions, were shown to be associated with TMDs.[17,18,24,25]

Supporting the data mentioned, Altın et al.[26] explored the association between TMD severity and contributing factors among university students. Fifty-one participants (39 females and 12 males) were assessed using the Fonseca Anamnestic Index (FAI) to evaluate TMD severity. They concluded significant associations between TMD severity and poor sleep quality, jaw and neck pain, and depression levels. A weaker but significant correlation was also observed with anxiety. Neck pain and oral habits were identified as significant predictors of TMD severity. Although this study comprehensively evaluates multiple factors related to TMDs, its findings are limited by potential gender bias, the absence of gender-specific analysis, and the restricted sample of university students, which reduces generalizability to large populations.

Furthermore, there has always been a debate regarding the most common etiological factor associated with TMDs. Some authors address the key role of occlusal abnormalities as the primary etiological factor for TMDs,[27,28] while others attribute the underlying causes of TMD to psychological and neurological factors.[29,30] Moreover, another systematic review reported a significant association between genetic polymorphisms and TMD onset and progression. However, it had some limitations, including heterogeneity among the available data and limited sample sizes, which restricted the strength of the meta-analysis.[31]

These data may be of significance to clinicians and dental professionals, as they highlight the crucial role of these factors in determining TMD severity, underscoring the importance of a multidimensional approach to assessment and management when treating patients with TMDs.

Symptoms of TMDs

TMD signs and symptoms remain rare in childhood, while significant prevalence occurs in adolescence and adulthood.[32] The most frequently occurring signs of TMDs are restricted or abnormal mandibular range of motion and noises or clicking during mouth opening and closing.[11] The most prevalent symptoms of TMDs are painful sensations during mandibular movements or even at rest, and myalgia.[33]

Pain is caused by changes in the muscles responsible for mandibular movements.[16,25,34,35] TMD symptoms range from mild discomfort to more severe symptoms such as debilitating pain and limitations of jaw function, with this progression reflected in the classification of these disorders.[17,36]

Supporting the previous data, a 3-year prospective study by Ângelo et al.[33] used the EUROTMJ database to assess 595 patients for TMDs (80.5% female; mean age = 38.2 years). Researchers found that the most frequent symptoms associated with TMDs involved TMJ clicking (13.3%), TMJ pain (12.5%), and masticatory muscle tension (12.2%). This study demonstrates many methodological strengths, such as employing both a standardized questionnaire and a clinical examination at the initial appointment, a single experienced examiner to ensure diagnostic consistency, and the EUROTMJ database. However, limitations include the lack of validation of the database and questionnaire, the potential for information bias due to reliance on VAS scoring, and the omission of correlations between signs, symptoms, diagnosis, and treatment.

Furthermore, some studies have reported ear symptoms as prevalent signs associated with TMDs. A study of 464 Greek university students (mean age, 19.6 years) found that the most frequent sign was TMJ pain, which, along with joint ankylosis and ear itching, showed significant variations between subjects with and without TMDs. TMD severity was also correlated with reduced mouth opening, aural symptoms, and hearing loss, where moderate and severe TMDs were linked to deficits in median and low tones, respectively.[37] In agreement with these findings, a study of 132 TMD patients demonstrated that ear symptoms were highly prevalent (72%). Ear symptoms were more common in older patients and females, and showed significant associations with myalgia, TMJ pain, reduced mouth opening, parafunctions, and certain occlusal factors.[38] While the study demonstrates significant associations between TMDs and ear symptoms, the findings are limited by several factors. Firstly, the study relies mainly on self-reported data without medical confirmation, which can lead to inaccuracies. Additionally, the use of binary (yes/no) responses lacks detail on symptom severity or frequency, and the long recall period restricts the accuracy and depth of the findings.

Therefore, more systematic reviews and longitudinal studies are needed to validate the common signs and symptoms associated with TMDs, thereby providing a more comprehensive guide for dentists and clinicians. Understanding TMD signs and symptoms is crucial for clinicians to ensure accurate diagnosis, effective management, and improved quality of life for TMD patients. Clinicians and dental professionals should therefore be particularly attentive to the most frequently reported symptoms.

Classification of TMDs

The TMD classification structure is published by the International Research Diagnostic Criteria for Temporomandibular Dysfunction Consortium Network.[39] The two broad categories of TMD are intraarticular (articular disorders), occurring within the TMJ, and extraarticular (masticatory muscle disorders), involving the musculature surrounding the joint.[11,17,39,40]

The intraarticular category encompasses the following clusters: congenital or developmental disorders, degenerative joint disorders (DJDs), disc derangement disorders, infection, neoplasia, temporomandibular hypomobility, and trauma.[25,39–41]

The extraarticular category encompasses local myalgia, myofascial pain disorder, myositis, myofibrotic contracture, myospasm, and neoplasia.[17,39,40]

Diagnosis of TMDs

TMD diagnosis relies on the patient's history and findings from physical examinations.[17] In most TMD cases, jaw excursion movements are associated with pain, sounds (clicking, grating, popping), and crepitus.[17]

Physical examination for TMD patients may reveal abnormal mandibular movement, malocclusion, tenderness in the masticatory muscles, decreased range of motion, bruxism signs, pain with dynamic loading, and tenderness of the neck or shoulders.[26]

When diagnosing TMDs, intraarticular derangement is suggested where there is reproducible tenderness upon palpation of the TMJ. Anterior articular disc displacement (DD) may be indicated where mandibular deviation occurs during mouth opening. Myalgia or referred pain syndrome may be indicated by tenderness in related muscles.[17]

Recently, imaging has been used to diagnose cases where history and physical examination are insufficient.[42] Plain radiography (transmaxillary and transcranial views, panoramic radiography) and computed tomography can be used for diagnostic purposes in TMD patients.[17] Magnetic resonance imaging (MRI) is deemed to be the gold standard modality for TMD diagnosis because of its precision in detecting abnormalities of soft tissues, which are unclear in traditional plain radiographs.[43]

Supporting the role of MRI in the diagnosis of TMDs, a study investigated the correlation between MRI findings and TMJ pain, concluding that MRI findings of osteoarthritis, joint effusion, and bone marrow edema exhibit a strong association with TMJ pain. However, MRI is usually used only for cases with persistent symptoms, cases where conservative therapy has proven ineffective, or where internal joint derangement is suspected.[17]

Ultrasonography is another modality that can also be used where MRI is unavailable.[41–44] Several studies have compared the diagnostic accuracy of ultrasonography (US) and MRI in TMD diagnosis. A study assessed the effectiveness of high-resolution US in comparison to MRI among 50 patients (35 females and 15 males, mean age 30.61 years) presenting with TMDs. Clinical examination and bilateral imaging using both modalities were performed to evaluate DD and joint effusion, with MRI serving as the reference standard. Diagnostic accuracy of US showed sensitivity, specificity, PPV, NPV, and accuracy ranging from 0.88–1, 0.60–0.87, 0.70–0.97, 0.75–1, and 0.84–0.98, respectively, for DD, while for effusion detection, values ranged from 0.65–0.81, 0.91–1, 0.96–1, 0.45–0.46, and 0.72–0.84, respectively. US measurements demonstrated minimal mean differences (−0.182 to +0.130 mm) compared to MRI. The findings suggest that US is a reliable and effective adjunct to MRI in assessing TMDs.[45] However, this study has several limitations, including reliance on a single main observer with limited assessment of interobserver reliability, a relatively small sample size of 50 patients, restricting generalizability, and the operator- and patient-dependent nature of ultrasound, which may compromise reproducibility without standardized protocols. Moreover, the study focused mainly on DD and effusion, overlooking muscular disorders that are integral to TMDs.

Therefore, clinicians and specialists should be detail-oriented when diagnosing TMD patients, use necessary diagnostic modalities like imaging, obtain full medical and dental history, and perform meticulous clinical examination since there are differential diagnoses such as dental caries or abscess, conditions resulting from overuse of the muscles, trauma or dislocation, various types of neuralgia, primary headache syndrome, autoimmune diseases, such as Sjögren syndrome and arthritis.[17,46–48]

Screening of TMDs

TMD screening stands as a challenge that clinicians often face in their clinical practice due to the multifactorial etiology and the diverse range of clinical symptoms and manifestations of TMDs. To standardize and improve diagnostic accuracy, the research diagnostic criteria for TMD (RDC/TMD) were introduced in the early 1990s. While the RDC/TMD showed acceptable reliability when diagnosing common TMDs, several concerns were raised regarding its validity and diagnostic accuracy for less common TMDs.[49]

Therefore, the RDC/TMD was then updated into the diagnostic criteria for TMDs (DC/TMDs) in 2014. The DC/TMD, is a standardized tool of superior acceptance for both clinical and research applications, provides a dual-axis framework: Axis I addresses physical diagnoses or clinical examinations, assessing pain, jaw function, range of motion, joint sounds, joint tenderness, parafunctional habits, and occlusal factors including malocclusion; Axis II evaluates psychosocial dimensions, incorporating self-report questionnaires and interviews to assess emotional status, pain-related

 DOI: https://doi.org/10.70389/PJD.100005 | Premier Journal of Dentistry 2025;3:100005

disability, anxiety, depression, and quality of life (Access the full DC/TMD Criteria through the official website: https://inform-iadr.com/index.php/tmd-assessmentdiagnosis/dc-tmd/) (Table 2).[50]

The FAI stands as another efficient tool for TMD screening, offering a simple, low-cost, patient-reported questionnaire and requiring no prior training. Therefore, it may be suitable for large-scale populations or telephone-based screening. It demonstrates good accuracy and is useful in epidemiological studies or as a preliminary tool before gold standard assessments, such as the DC/TMD. However, it cannot replace clinical evaluation. Additionally, it has limitations, as some items or questions may not be quite relevant to TMD etiology and symptoms.[51]

Table 2 | Summary of DC/TMD criteria

Axis	Instruments
Axis I (Clinical Assessment)	TMD Pain Screener
	Symptom Questionnaire
	Demographics
	Examination: Pain-related Interview & Examiner Commands
	Examination Form: International
	Decision Tree & Diagnostic Criteria Table
	Pain Drawing
Axis II (Assessment of Psychosocial aspects and Pain-related Disability)	Graded Chronic Pain Scale (GCPS), version 2
	JFLS-8/JFLS-20
	PHQ-4
	PHQ-9
	GAD-7
	PHQ-15
	Oral Behavior Checklist

The GCPS stands for Graded Chronic Pain Scale, version 2, measuring the level of pain intensity and related disability. The JFLS-8/JFLS-20 stands for Jaw Functional Limitation Scale, available in 8- and 20-item versions, designed to assess limitations in jaw function. The PHQ-4 stands for Patient Health Questionnaire-4, a brief screening tool used to assess anxiety and depression, while the PHQ-9 stands for Patient Health Questionnaire-9, which is designed to measure the severity of depression. The GAD-7 stands for Generalized Anxiety Disorder scale-7, assessing the severity of anxiety symptoms, and the PHQ-15 stands for Patient Health Questionnaire-15, used to assess somatic symptom severity.

The FAI screens for the presence of pain (head, back, and pain while chewing), joint clicking, parafunctional habits, perception of malocclusion, movement limitations, and sensation of emotional stress.[22] The FAI also allows for the classification of TMD severity in a progressive trajectory as 'none,' 'mild,' 'moderate,' and 'severe.'[12] Clinicians or epidemiologists can easily use the FAI for detecting TMD signs in preliminary population screenings.[52]

When the affected population is identified, clinical examination using diagnostic instruments can then be conducted to confirm the diagnosis.[10,13,32,53]

Kothari et al.[54] conducted a study on individuals with acquired brain injury (ABI), evaluating TMD presence, severity, and progression while comparing the diagnostic accuracy of the 3Q/TMD and FAI against the DC/TMD. At admission, TMD was detected in 66% (3Q/TMD) and 27.8% (FAI), mostly mild to moderate and pain-related, with frequencies decreasing by Week 4. Both instruments demonstrated high accuracy (0.82–0.83) and specificity (0.90–0.93), but low sensitivity, suggesting that the FAI could be employed as a screening tool rather than a definitive diagnostic instrument. However, this study was limited by a relatively modest sample size. Moreover, its cross-sectional design limited the ability to establish causal relationships. Additionally, reliance on self-reported questionnaires introduced the potential for recall bias.

Therefore, TMD screening stands as a valuable diagnostic service for the patient, allowing the dentist to make informed decisions based on both a thorough clinical examination and a psychosocial factors assessment. However, the current evidence highlights variability in the reliability, validity, and accuracy of available screening tools, emphasizing the necessity for future research and systematic reviews to rigorously evaluate and compare these instruments in clinical practice.

Prevalence of TMDs

Studies on TMD prevalence have measured its incidence as well as associations with variables such as gender, age, SES, stress, and conditions such as anxiety, depression, osteoporosis, and many more.[55–57] Numerous research designs have been used in studies on TMD prevalence, such as cross-sectional studies;[58,59] systematic reviews and meta-analyses;[15,60,61] and standard questionnaire-based studies with FAI.[59]

Zieliński et al.[60] performed a meta-analysis to determine the global TMD prevalence, including 74 studies and 172,239 participants. They reported a global prevalence of 34%, affecting 35,259 individuals. The most vulnerable age group was between 18 and 60 years. Across continents, the female group exceeded the male group by 9–56%, with the highest female-to-male ratio observed in South America (1.56) and the lowest in Europe (1.09). Prevalence also varied geographically, being highest in South America (47%), followed by Asia (33%) and Europe (29%) (Figure 2). The findings were

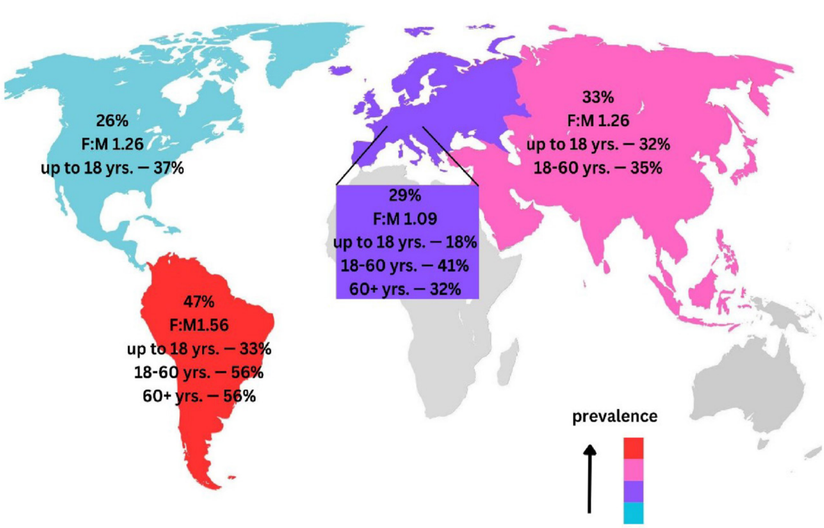

Fig 2 | Distribution of TMD prevalence across continents, age groups, and gender ratios (F:M), obtained from Zieliński et al.[60]

considered robust, with minimal publication bias; however, further large-scale epidemiological studies in Africa and Australia were recommended. Additionally, this meta-analysis did not assess the relationship between psychosocial factors and TMD prevalence.

Another systematic review by Valesan et al. investigated 21 studies (out of 2,741 screened). Researchers assessed the prevalence of TMDs using RDC/TMD or DC/TMD diagnostic criteria. Among adults/elderly, the pooled prevalence was 31.1% for TMDs, 19.1% for DDs, and 9.8% for DJD, with DD with reduction being the most common (25.9%). Despite providing valuable prevalence estimates, the review did not assess the association between TMDs and gender or psychosocial factors. Additionally, it reported high heterogeneity across studies due to differences in sample characteristics, diagnostic criteria (RDC/TMD vs DC/TMD), and methodological quality.[61]

Furthermore, Lai et al.[15] conducted a systematic review of 11 studies to assess TMD prevalence among patients seeking orthodontic treatment. Reported prevalence rates varied widely, ranging from 21.1 to 73.3%. Painful TMD signs and symptoms were reported in 3.4–65.7% of cases, and nonpainful signs were observed in 3.1–40.8% of cases. Gender-specific data showed prevalence ranging from 10.6–68.1% in males and 21.2–72.4% in females, with all studies confirming higher rates in females. Age was also a factor, with most studies indicating that patients over 18 years experienced more TMD signs and symptoms compared to younger individuals. Although this systematic review provided comprehensive insights about TMD prevalence and the association between TMD and other factors like gender and age, it did not report the impact of psychosocial factors on these findings. Moreover, the review lacked a standardized TMD assessment.

Several cross-sectional studies have investigated TMD prevalence in various populations. Alharbi et al.[58] examined 100 undergraduate medical and dental students for TMD prevalence at Taif University (Saudi Arabia) using a self-administered questionnaire and clinical examinations based on Helkimo's index (anamnestic and clinical dysfunction components). They reported a strikingly high prevalence of 97% (Figure 3). Half of the participants (44%) experienced severe symptoms that impacted their quality of life. Significant associations were also identified with older age, dental education, allergies, oral habits, and poor mental health. While this study offers valuable insight into the high prevalence of TMDs, its cross-sectional design limits causal inference. Additionally, the small sample size and restriction to a single institution reduce generalizability to other student populations. Another limitation is the lack of standardized diagnostic tools such as the DC/TMD, which restricts comparability with other studies. Importantly, the study did not assess potential associations between TMD prevalence and gender. Future research should employ standardized diagnostic criteria, include larger and more diverse populations, and explore sociodemographic variables to strengthen the evidence base.

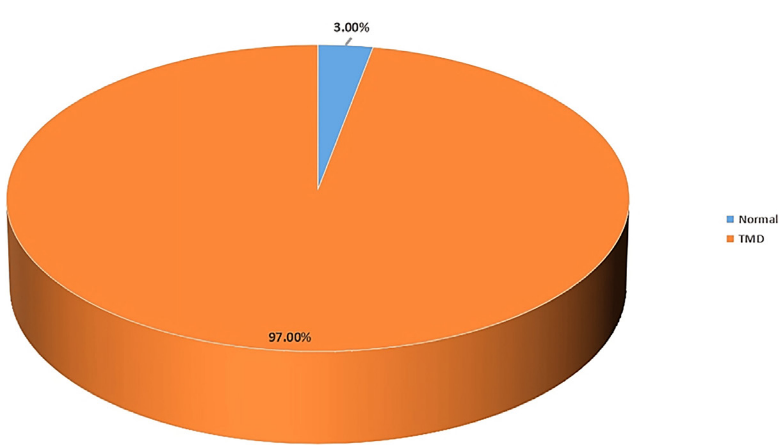

Fig 3 | TMD prevalence among the study's participants, obtained from Alharbi et al.[58]

Another cross-sectional household-based study with a larger sample size in southern Brazil assessed TMD symptoms among 282 older adults (≥60 years) using the FAI. TMD prevalence was estimated to be 30.5% (n = 86). Female seniors showed a significantly higher likelihood of reporting TMDs, with a 63.6% higher prevalence ratio (PR: 1.636; 95% CI: 1.029–2.601; $p = 0.040$) compared to males. The findings emphasize the gender disparity in older adults with TMDs, though the cross-sectional design limits causal interpretation.[59]

As shown in previous studies, TMD prevalence rates may vary due to several factors, including variations in populations and demographics (age, gender, geographic location, ethnicity), varying diagnostic criteria and assessment tools (such as the DC/TMD criteria or the FAI), heterogeneous methodologies (including sampling design and examiner training), and the influence of specific risk factors like bruxism, trauma, and psychosocial stressors. Therefore, future research should implement standardized diagnostic criteria, include larger and more diverse populations, explore sociodemographic variables to strengthen the evidence base, and investigate the association between TMD prevalence and related factors, such as gender and psychosocial factors.

Association Between TMDs and Emotional Stress

The association between TMD prevalence and emotional stress has been established through numerous studies; emotional stress was variously represented or characterized in such studies as anxiety, depression, and emotional and psychological distress.[12,29,62]

For example, Minghelli et al.[12] investigated the prevalence of TMDs and their relationship with psychological factors. The researchers included 1,493 Portuguese college students (471 males and 1,022 females) at the Piaget Institute. Using the FAI and the Hospital Anxiety and Depression Scale, the researchers found that 42.4% (n = 633) of students presented with TMD symptoms, while 30.5% (n = 456) reported signs of anxiety or depression. Importantly, 61.4% (n = 280) of those with TMDs also exhibited anxiety or depression ($p < 0.001$). Female students had a significantly higher risk, with an odds ratio (OR) of 1.9 (95% CI: 1.53–2.46; $p < 0.001$), compared to males. Moreover, the likelihood of TMD was more than threefold higher among students with anxiety or depression (OR = 3.1, 95% CI: 2.42–3.84, $p < 0.001$). These findings demonstrate not only the high TMD prevalence among young adults but also the potential relationship between TMD and psychosocial factors, particularly anxiety, depression, and female gender. However, this study adopted self-reported questionnaires without clinical confirmation or imaging, which may limit diagnostic accuracy. Important confounders such as academic workload and traineeship area were not considered. Additionally, the unequal gender distribution, with females comprising the majority of participants, may have inflated the observed association between gender and TMD, reducing the generalizability of the findings.

Furthermore, Xiang et al.[62] performed a two-sample bidirectional Mendelian randomization study to assess causal links between TMDs and eight psychiatric disorders. The analysis found that panic disorder and major depressive disorder significantly increased the risk of TMDs, with suggestive associations for neuroticism and schizophrenia, while no reverse causal effect of TMD on psychiatric traits was detected. The findings indicate the key role of mental health as a risk factor for TMDs. While this study emphasizes the causal relationship between psychiatric disorders and TMDs, it was limited by the relatively small TMD sample size, potential missed associations, restriction to European populations, and lack of sex-stratified analyses despite known gender differences in TMD prevalence and symptomatology.

Additionally, a recent systematic review of 21 studies (from 2,392 screened articles) confirmed significant associations between TMDs and psychological factors, particularly anxiety, depression, stress, and somatization. Subgroup analyses highlighted gender- and age-related differences, with depression more strongly linked to TMD in males, and anxiety and depression in adults. These findings highlight the significant role of psychological factors as key risk factors in TMD development and progression. Although the included studies in this systematic review were of good methodological quality, limitations such as a lack of clarity on assessor blinding and inadequate adjustment for confounding factors (e.g., age, SES, comorbidities) may have introduced bias, particularly given the subjectivity of psychological assessments.[29]

As we mentioned in previous studies, there is evidence suggesting a strong correlation between TMDs and psychological factors; hence, adopting a multimodal management approach is of prime importance. This approach should combine psychological interventions (e.g., cognitive-behavioral therapy, stress management) with conventional physical treatments to create an improved treatment plan and enhance quality of life. Future studies should further explore this biopsychosocial relationship with rigorous methodologies.

Association Between TMDs and Gender

The results from numerous studies show that TMDs are associated with gender, with women being more affected.[53,63,64] The higher representation of women in TMD has been consistently noted in studies with diverse designs. For example, Bueno et al.[63] performed a systematic review and meta-analysis of 5 studies (n = 2,518) to investigate gender differences in TMD prevalence using RDC/TMD Axis I criteria. Women showed significantly higher prevalence across all diagnostic groups. The pooled ORs were: 2.24 for global TMD, 2.09 for muscle disorders (Group I), 1.6 for DDs (Group II), and 2.08 for arthralgia/arthritis/arthrosis (Group III). Overall, women had approximately twice the risk of developing TMDs compared to men. This systematic review focuses on important gender-related differences in TMD prevalence; however, only five nonclinical population-based studies were included, all from Europe and Latin America, with most involving young adults, which may reduce generalizability. Moreover, subgroup details (RDC/TMD categories) and adjustment for confounding factors, such as examiner variability or cultural influences, were limited. Furthermore, reliance on screening questionnaires with low sensitivity and the absence of longitudinal data reduces the strength of conclusions. The marked overrepresentation of young, treatment-seeking females also suggests possible selection bias.

Another cross-sectional study by Bagis et al.[64] examined 243 patients with TMDs. They reported more females (n = 171; mean age, 35 years) than males (n = 72; mean age, 41 years). Compared to males, females reported significantly higher rates of TMJ pain at rest, masseter muscle pain, and TMJ sounds. Although the study confirms a higher TND prevalence among females, its cross-sectional design restricts the ability to prove causal relationships, making it difficult to determine whether gender differences are due to biological, psychological, or social factors.

Furthermore, Karthik et al.[53] conducted a cross-sectional study to examine 402 university students. TMDs showed higher prevalence rates among females than males. Out of the total participants, 267 females (66.4%) and 135 males (33.6%) were included. Normal findings were more common in females (n = 202, 65%) than in males (n = 109, 35%). Among those with TMDs, females accounted for the majority of mild cases (n = 54, 69.2%), moderate cases (n = 9, 81.8%), and all severe cases (n = 2, 100%). Nevertheless, this study relies on self-reported questionnaires and lacks thorough clinical examination, which limits the accuracy of the findings.

Therefore, the current literature and evidence-based data suggest that females may have nearly double the risk of developing TMDs compared to males, which carries important clinical implications. Clinicians and dental professionals should perform careful diagnosis and thorough examination with imaging when females present with symptoms or signs associated with TMDs, highlighting the need for early identification and targeted preventive strategies in female patients. Given the multifactorial nature of TMDs and the variability in clinical presentation, further well-designed studies are essential to establish specialized gender-sensitive approaches for an effective treatment plan.

Association Between TMDs and Socioeconomic Status (SES)

Although there is scarce literature focusing specifically on the direct correlation between TMDs and SES, several studies have reported a significant relationship. For instance, a recent systematic review and meta-analysis by Minervini et al. evaluated the association between SES and TMDs, including 14,607 participants across income and occupational groups. The findings showed that individuals with low income or blue-collar occupations had a slightly higher prevalence of TMDs (12.9%) compared to those with higher income or white-collar occupations (10.6%). Although the difference was modest, the review suggests that socioeconomic disparities may influence TMD prevalence.[65]

SES may play a role in the prevalence and management of TMDs, but current evidence remains limited and inconclusive. So, future longitudinal studies are needed to clarify this relationship and inform equitable care strategies.

Conclusion

According to the review, TMDs are among the most prevalent nondental orofacial pain conditions. Females have a higher risk of developing TMDs compared to males. Additionally, stress, anxiety, and depression may increase the frequency and severity of TMD symptoms. However, there is limited evidence to establish an association between TMDs and SES. The researchers also noted that the prevalence of TMDs has grown in the general population over the past several decades, so early detection of TMDs using imaging and other diagnostic tools may enable prompt therapeutic and noninvasive interventions, thus preventing or minimizing the disease's severity and progression. Future studies should be sufficiently large to accurately estimate the exact TMD prevalence rate and identify key confounding factors.

List of Abbreviations

TMJ: Temporomandibular Joint
TMD: Temporomandibular Disorder
FAI: Fonseca's Anamnestic Index
DC/TMD: Diagnostic Criteria for Temporomandibular Disorders
RDC/TMD: Research Diagnostic Criteria for Temporomandibular Disorders
MRI: Magnetic Resonance Imaging
CMD: Common Mental Disorder
SES: Socioeconomic Status
BMI: Body Mass Index

References

1 Kalladka M, Quek S, Heir G, Eliav E, Mupparapu M, Viswanath A. Temporomandibular joint osteoarthritis: diagnosis and long-term conservative management: a topic review. J Indian Prosthod Soc. 2014;14(1):6–15. https://doi.org/10.1007/s13191-013-0321-3
2 Lomas J. Temporomandibular dysfunction. Aust J General Pract. 2018;47(4):212–5. https://doi.org/10.31128/AFP-10-17-4375
3 Wojciechowska B, Szarmach A, Michcik A, Wach T, Drogoszewska B. Association between clinical manifestations in temporomandibular joint disorders and corresponding radiographic findings. J Clin Med. 2024;13(16):4886. https://doi.org/10.3390/jcm13164886
4 Jang J-Y, Kwon J-S, Lee DH, Bae J-H, Kim ST. Clinical signs and subjective symptoms of temporomandibular disorders in instrumentalists. Yonsei Med J. 2016;57(6):1500. https://doi.org/10.3349/ymj.2016.57.6.1500
5 Li DTS, Leung YY. Temporomandibular disorders: current concepts and controversies in diagnosis and management. Diagnostics. 2021;11(3):459. https://doi.org/10.3390/diagnostics11030459
6 Reiter S, Emodi-Perlman A, Goldsmith C, Friedman-Rubin P, Winocur E. Comorbidity between depression and anxiety in patients with temporomandibular disorders according to the research diagnostic criteria for temporomandibular disorders. J Oral Facial Pain Headache. 2015;29(2):135–43. https://doi.org/10.11607/ofph.1297
7 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):1–13. https://doi.org/10.19080/ADOH.2019.10.555787
8 Shetty A, James L, Nagaraj T, Abraham M. Epidemiology of orofacial pain: a retrospective study. J Adv Clin Res Insights. 2015;2(1):12–5. https://doi.org/10.15713/ins.jcri.34
9 Chisnoiu AM, Picos AM, Popa S, Chisnoiu PD, Lascu L, Picos A, et al. Factors involved in the etiology of temporomandibular disorders-a literature review. Clujul Med. 2015;88(4):473. https://doi.org/10.15386/cjmed-485
10 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. https://doi.org/10.4103/ccd.ccd_689_17
11 Mahabob MN. Temporomandibular disorders: an updated review. Int J Prev Clin Dent Res. 2020;7(4):111–4. https://doi.org/10.4103/ijpcdr.ijpcdr_42_20
12 Minghelli B, Morgado M, Caro T. Association of temporomandibular disorder symptoms with anxiety and depression in Portuguese college students. J Oral Sci. 2014;56(2):127–33. https://doi.org/10.2334/josnusd.56.127
13 Syed RA, Syeda AA, Katt G, Arora V. Prevalence of temporomandibular joint disorders in outpatients at Al-Badar Dental College and Hospital and its relationship to age, gender, occlusion and psychological factors. J Indian Acad Oral Med Radiol. 2012;24(4):261–8. https://doi.org/10.5005/jp-journals-10011-1310
14 Ayesh Dweiri BDM. The prevalence of symptoms and signs of temporomandibular disorders among a Group of Young Adult Jordanian Population. JRMS. 2013;20(3):44–50. https://doi.org/10.12816/0001040
15 Lai YC, Yap AU, Türp JC. Prevalence of temporomandibular disorders in patients seeking orthodontic treatment: a systematic review. J Oral Rehabil. 2020;47(2):270–80. https://doi.org/10.1111/joor.12899
16 Yadav U, Ahmed J, Ongole R, Shenoy N, Sujir N, Natarajan S. Influence of psychosocial factors and parafunctional habits in temporomandibular disorders: a cross-sectional study. Perm J. 2020;24:19.144. https://doi.org/10.7812/TPP/19.144
17 Gauer RL, Semidey MJ. Diagnosis and treatment of temporomandibular disorders. Am Fam Phys. 2015;91(6):378–86. Available from: https://www.aafp.org/pubs/afp/issues/2015/0315/p378.pdf
18 Ali KFM, Fatima A, Ilyas F, Khan MWA, Abbassi ZA. Impact of anxiety and depression on temporomandibular joint disorders among sample of dental undergraduates of Karachi. J Pak Dent Assoc. 2016;25(4):143–49. Available from: https://www.researchgate.net/publication/323522391
19 Kim SY, Yoo DM, Kwon MJ, Kim JH, Kim J-H, Byun S-H, et al. Increased risk of temporomandibular joint disorder in osteoporosis patients: a longitudinal study. Front Endocrinol. 2022;13:835923. https://doi.org/10.3389/fendo.2022.835923
20 Elagib MFA, Al-Qahtani S, Reddy M, Baldo SM, Sharif RA, Gokhale ST. Prevalence of signs and symptoms of temporomandibular joint disorders among Saudi population–a cross-sectional study. Int J Sci Study. 2018;6(6):52–7. https://doi.org/10.17354/ijss/2018/248

21 Akhter R, Morita M, Ekuni D, Hassan NMM, Furuta M, Yamanaka R, et al. Self-reported aural symptoms, headache and temporomandibular disorders in Japanese young adults. BMC Musculoskeletal Disord. 2013;14(1):58. https://doi.org/10.1186/1471-2474-14-58
22 Habib SR, Al Rifaiy MQ, Awan KH, Alsaif A, Alshalan A, Altokais Y. Prevalence and severity of temporomandibular disorders among university students in Riyadh. Saudi Dent J. 2015;27(3):125–30. https://doi.org/10.1016/j.sdentj.2014.11.009
23 Ghorbel W. Association of temporomandibular disorders symptoms with anxiety and depression in Tunisian patients. EAS J Dent Oral Med. 2021;3(2):25–30. https://doi.org/10.36349/easjdom.2021.v03i02.001
24 Smriti J, Patni V, Mukta M, Gangotri S. Association between symptoms of temporomandibular disorders and gender, morphological occlusion, and psychological factor in dental student's. Int J Sci Study. 2014;2:55–8. https://doi.org/10.4103/0970-9290.52901
25 List T, Jensen RH. Temporomandibular disorders: old ideas and new concepts. Cephalalgia. 2017;37(7):692–704. https://doi.org/10.1177/0333102416686302
26 Altın FN, Aslan Telci E, Özden F. Evaluation of factors associated with the temporomandibular joint dysfunction in university students. Bull Fac Phys Ther. 2024;29(1):83. https://doi.org/10.1186/s43161-024-00249-9
27 Pascu L, Haiduc R-S, Almăşan O, Leucuța D-C. Occlusion and temporomandibular disorders: a scoping review. Medicina. 2025;61(5):791. https://doi.org/10.3390/medicina61050791
28 Al-Ani Z. Occlusion and temporomandibular disorders: a long-standing controversy in dentistry. Prim Dent J. 2020;9(1):43–8. https://doi.org/10.1177/2050168420911029
29 Saini RS, Quadri SA, Mosaddad SA, Heboyan A. The relationship between psychological factors and temporomandibular disorders: a systematic review and meta-analysis. Head Face Med. 2025;21(1):46. https://doi.org/10.1186/s13005-025-00522-9
30 Santos EAd, Peinado BRR, Frazao DR, Né YGdS, Fagundes NCF, Magno MB, et al. Association between temporomandibular disorders and anxiety: a systematic review. Front Psychiatry. 2022;13:990430. https://doi.org/10.3389/fpsyt.2022.990430
31 Alshahrani AA, Saini RS, Okshah A, Alshadidi AAF, Kanji MA, Vyas R, et al. The association between genetic factors and temporomandibular disorders: a systematic literature review. Arch Oral Biol. 2024;166:106032. https://doi.org/10.1016/j.archoralbio.2024.106032
32 Al-Khotani A, Naimi-Akbar A, Albadawi E, Ernberg M, Hedenberg-Magnusson B, Christidis N. Prevalence of diagnosed temporomandibular disorders among Saudi Arabian children and adolescents. J Headache Pain. 2016;17(1):41. https://doi.org/10.1186/s10194-016-0642-9
33 Ângelo DF, Mota B, João RS, Sanz D, Cardoso HJ. Prevalence of clinical signs and symptoms of temporomandibular joint disorders registered in the EUROTMJ Database: a prospective study in a Portuguese Center. J Clin Med. 2023;12(10):3553. https://doi.org/10.3390/jcm12103553
34 Chuinsiri N, Jitprasertwong P. Prevalence of self-reported pain-related temporomandibular disorders and association with psychological distress in a dental clinic setting. J Int Med Res. 2020;48(9):0300060520951744. https://doi.org/10.1177/0300060520951744
35 Mishra R. Global burden of temporomandibular disorder (TMD): a systematic review of TMD prevalence and incidence (1990-January 2019). Dissertation. 2019. https://doi.org/10.13140/RG.2.2.27134.41284
36 Chantaracherd P, John M, Hodges J, Schiffman E. Temporomandibular joint disorders' impact on pain, function, and disability. J Dent Res. 2015;94(3_suppl):79S–86S. https://doi.org/10.1177/0022034514565793
37 Kitsoulis P, Marini A, Iliou K, Galani V, Zimpis A, Kanavaros P, et al. Signs and symptoms of temporomandibular joint disorders related to the degree of mouth opening and hearing loss. BMC Ear Nose Throat Disord. 2011;11(1):5. https://doi.org/10.1186/1472-6815-11-5
38 Mejersjö C, Pauli N. Ear symptoms in patients with orofacial pain and dysfunction-an explorative study on different TMD symptoms, occlusion and habits. Clin Exp Dent Res. 2021;7(6):1167–74. https://doi.org/10.1002/cre2.457
39 Schiffman E, Ohrbach R, Truelove E, Look J, Anderson G, Goulet J-P, et al. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group. J Oral Facial Pain Headache. 2014;28(1):6. https://doi.org/10.11607/jop.1151
40 Schiffman EL, Truelove EL, Ohrbach R, Anderson GC, John MT, List T, et al. The research diagnostic criteria for temporomandibular disorders. I: overview and methodology for assessment of validity. J Orofac Pain. 2010;24(1):7. Available from: https://files.jofph.com/files/article/20231221-627/pdf/jop_24_1_Schiffman_2.pdf
41 Mizuhashi F, Ogura I, Watarai Y, Suzuki T, Mizuhashi R, Oohashi M, et al. Examination for the factors contribute to joint effusion in patients with internal derangement on temporomandibular joint disorder. J Oral Maxillofac Radiol. 2022;10(2):45–8. https://doi.org/10.3390/jimaging9050101
42 Nadershah M, Abdel-Alim HM, Bayoumi AM, Jan AM, Elatrouni A, Jadu FM. Photobiomodulation therapy for myofascial pain in temporomandibular joint dysfunction: a double-blinded randomized clinical trial. J Maxillofac Oral Surg. 2020;19(1):93–7. https://doi.org/10.1007/s12663-019-01222-z
43 Li C, Zhang Q. Comparison of magnetic resonance imaging findings in 880 temporomandibular disorder patients of different age groups: a retrospective study. BMC Oral Health. 2022;22(1):651. https://doi.org/10.1186/s12903-022-02666-5
44 Ribeiro MC, Meusel LDZv, Gaviolli E, Silveira AM, Cericato GO. Prevalence of TMJ pain symptom in adults and its association with predisposing factors. Biosci J(Online). 2018:1815–23. https://doi.org/10.14393/BJ-v34n6a2018-42404
45 Yılmaz D, Kamburoğlu K. Comparison of the effectiveness of high resolution ultrasound with MRI in patients with temporomandibular joint dısorders. Dentomaxillofac Radiol. 2019;48(5):20180349. https://doi.org/10.1259/dmfr.20180349
46 Aboubakr R, Elkwatehy W. Knowledge about temporomandibular joint disorders among dental students in Saudi Arabia. Egypt Dent J. 2021;67(4):2885–92. https://doi.org/10.21608/edj.2021.82405.1688
47 Alkhudhairy MW, Al Ramel F, Al Jader G, Al Saegh L, Al Hadad A, Alalwan T, et al. A self-reported association between temporomandibular joint disorders, headaches, and stress. J Int Soc Prev Commun Dent. 2018;8(4):371–80. https://doi.org/10.4103/jispcd.JISPCD_177_18
48 Bugaighis I, Elgehani R, Orafi M, Elatrash A. The prevalence of temporomandibular disorders among a group of Libyan dental students. Libyan Int Med Univ J. 2017;2(01):64–73. https://doi.org/10.21502/limuj.009.02.2017
49 Look JO, Schiffman EL, Truelove EL, Ahmad M. Reliability and validity of Axis I of the research diagnostic criteria for temporomandibular disorders (RDC/TMD) with proposed revisions. J Oral Rehabil. 2010;37(10):744–59. https://doi.org/10.1111/j.1365-2842.2010.02121.x
50 Minervini G, Marrapodi MM, Siurkel Y, Cicciù M, Ronsivalle V. Accuracy of temporomandibular disorders diagnosis evaluated through the diagnostic criteria for temporomandibular disorder (DC/TDM) Axis II compared to the Axis I evaluations: a systematic review and meta-analysis. BMC Oral Health. 2024;24(1):299. https://doi.org/10.1186/s12903-024-03983-7
51 Rodrigues-Bigaton D, de Castro EM, Pires PF. Factor and Rasch analysis of the Fonseca anamnestic index for the diagnosis of myogenous temporomandibular disorder. Braz J Phys Ther. 2017;21(2):120–6. https://doi.org/1016/j.bjpt.2017.03.007
52 Zagalaz-Anula N, Sánchez-Torrelo CM, Acebal-Blanco F, Alonso-Royo R, Ibáñez-Vera AJ, Obrero-Gaitán E, et al. The short form of the Fonseca anamnestic index for the screening of temporomandibular disorders: validity and reliability in a Spanish-speaking population. J Clin Med. 2021;10(24):5858. https://doi.org/10.3390/jcm10245858
53 Karthik R, Hafila MF, Saravanan C, Vivek N, Priyadarsini P, Ashwath B. Assessing prevalence of temporomandibular disorders among university students: a questionnaire study. J Int Soc Prev Commun Dent. 2017;7(Suppl 1):S24–9. https://doi.org/10.4103/jispcd.JISPCD_146_17
54 Kothari M, Alves-Costa S, Kumar A, Nascimento GG, Nielsen JF, Svensson P, et al. Temporomandibular disorders in brain injury patients and diagnostic accuracy of the assessment tools. Oral Dis. 2025;31:2251–60. https://doi.org/10.1111/odi.15281

55 Iodice G, Michelotti A, D'Antò V, Martina S, Valletta R, Rongo R. Prevalence of psychosocial findings and their correlation with TMD symptoms in an adult population sample. Prog Orthod. 2024;25(1):39. https://doi.org/10.1186/s40510-024-00538-y

56 Loster JE, Osiewicz MA, Groch M, Ryniewicz W, Wieczorek A. The prevalence of TMD in Polish young adults. J Prosthod. 2017;26(4):284–8. https://doi.org/10.1111/jopr.12414

57 Warzocha J, Gadomska-Krasny J, Mrowiec J. Etiologic factors of temporomandibular disorders: a systematic review of literature containing diagnostic criteria for temporomandibular disorders (DC/TMD) and research diagnostic criteria for temporomandibular disorders (RDC/TMD) from 2018 to 2022. Healthcare (Basel). 2024;12:575. https://doi.org/10.3390/healthcare12050575

58 Alharbi AA, Shukr BS, Algethami MA, Alhumaidi FY, Mohaymidan NM, Alharbi A, et al. The prevalence of temporomandibular disorders among dental and medical students in Taif, Saudi Arabia: a Cross-Sectional study. Cureus. 2024;16(7):e65827. https://doi.org/10.7759/cureus.65827

59 Zatt FP, Muniz FWMG, Trevizan TC, Scalco NR, Calcia TBB, Colussi PRG. Prevalence of temporomandibular disorder and possible associated factors in a sample of older adults: population-based cross-sectional study. BrJP. 2021;4(3):232–8. https://doi.org/10.5935/2595-0118.20210050

60 Zieliński G, Pająk-Zielińska B, Ginszt M. A meta-analysis of the global prevalence of temporomandibular disorders. J Clin Med. 2024;13(5):1365. https://doi.org/10.3390/jcm13051365

61 Valesan LF, Da-Cas CD, Réus JC, Denardin ACS, Garanhani RR, Bonotto D, et al. Prevalence of temporomandibular joint disorders: a systematic review and meta-analysis. Clin Oral Investig. 2021;25(2):441–53. https://doi.org/10.1007/s00784-020-03710-w

62 Xiang Y, Song J, Liang Y, Sun J, Zheng Z. Causal relationship between psychiatric traits and temporomandibular disorders: a bidirectional two-sample Mendelian randomization study. Clin Oral Investig. 2023;27(12):7513–21. https://doi.org/10.1007/s00784-023-05339-x

63 Bueno C, Pereira D, Pattussi M, Grossi P, Grossi M. Gender differences in temporomandibular disorders in adult populational studies: a systematic review and meta-analysis. J Oral Rehabil. 2018;45(9):720–9. https://doi.org/10.1111/joor.12661

64 Bagis B, Ayaz EA, Turgut S, Durkan R, Özcan M. Gender difference in prevalence of signs and symptoms of temporomandibular joint disorders: a retrospective study on 243 consecutive patients. Int J Med Sci. 2012;9(7):539. https://doi.org/10.7150/ijms.4474

65 Minervini G, Franco R, Marrapodi MM, Fiorillo L, Cervino G, Cicciu M. Economic inequalities and temporomandibular disorders: a systematic review with meta-analysis. J Oral Rehabil. 2023;50(8):715–23. https://doi.org/10.1111/joor.13491