

Prevalence of Temporomandibular Disorders among Patients Reporting to Indira Gandhi Memorial Hospital, Malé, Maldives

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Abstract

Background: Temporomandibular disorders (TMDs) comprise a heterogeneous group of conditions affecting the temporomandibular joint (TMJ), masticatory muscles, and associated structures. Common manifestations include orofacial pain, joint sounds, and abnormalities of mandibular movement. Despite the considerable clinical burden of TMD, epidemiological information from the Maldives remains limited. **Objective:** To determine the prevalence of clinical signs and symptoms of temporomandibular disorders among patients reporting to Indira Gandhi Memorial Hospital (IGMH), Malé, Maldives. **Materials and Methods:** A descriptive prospective observational study was conducted among patients attending the Department of Oral and Maxillofacial Surgery and related clinical services at IGMH. A total of 384 participants aged 18 - 69 years were included in the final analysis. Clinical assessment included pain, TMJ sounds, mandibular deviation/deflection, and parafunctional habits. Participants fulfilling the study's clinical criteria for TMD were classified as TMD-positive. Data were analyzed using descriptive statistical methods. **Results:** Among 384 participants, 142 were identified as having TMD, giving an overall prevalence of **37.0%**. Among the TMD-positive participants, the prevalence in the younger population (59.6%) was more compared to the elder ones (11.6%). The female population was found to be greater (69.01%) in percentage compared to males (30.9%). Clicking was the most frequently observed finding among TMD-positive participants, occurring in 113 patients (79.6%), followed by pain in 109 (76.8%), mandibular deviation/deflection in 88 (62.0%), crepitus in 52 (36.6%), and parafunctional habits in 37 (26.1%). **Conclusion:** TMD findings were common among patients attending IGMH, with approximately one in three participants meeting the study criteria for TMD. Females demonstrated a higher prevalence than males with more prevalence in younger populations while clicking and pain were the predom-

inant clinical findings. These findings provide preliminary epidemiological data on TMD in the Maldivian clinical population and support the need for standardized assessment and further population-based research.

Keywords

Temporomandibular Disorders, Temporomandibular Joint, TMJ, Prevalence, Clicking, Pain, Crepitus, Maldives, Oral and Maxillofacial Surgery

1. Introduction

Temporomandibular disorders (TMDs) represent a heterogeneous group of musculoskeletal and neuromuscular conditions involving the temporomandibular joints, masticatory muscles, and associated structures. Patients may present with pain, joint sounds, limitation or alteration of mandibular movement, and functional impairment.

The development of standardized diagnostic systems has substantially improved the clinical and epidemiological study of TMD. The DC/TMD framework provides particularly useful diagnostic validity for common pain-related TMDs and selected intra-articular disorders [1]. An expanded TMD taxonomy was developed to include less common but clinically important disorders, categorizing them into four groups: temporomandibular joint disorders, masticatory muscle disorders, headache disorders, and disorders affecting associated structures. [2] TMJ sounds are among the most frequently reported clinical findings. Clicking may be associated with disc displacement with reduction, whereas crepitus may indicate degenerative joint changes; however, joint sounds alone should not automatically be interpreted as evidence of a painful TMD disorder. The DC/TMD classification emphasizes the distinction between clinical signs, symptoms, and specific diagnoses [1] [2].

A self-administered questionnaire assessing TMD-related symptoms, including jaw and muscle pain, joint sounds, locking, and difficulty opening the mouth, demonstrated acceptable validity for epidemiological assessment. The questionnaire showed particularly good sensitivity and specificity for TMJ pain and difficulty with wide mouth opening, supporting its potential usefulness for screening TMD symptoms [3].

Epidemiological studies have demonstrated that TMDs are relatively common in adult populations, although reported prevalence varies according to the population studied, sampling strategy, case definition, and diagnostic methodology. A systematic review and meta-analysis found substantial variation in the prevalence of temporomandibular joint disorders across studies, highlighting the influence of diagnostic criteria and study methodology on reported estimates [4].

Sex differences have also been consistently reported in TMD epidemiology. Women tend to demonstrate a greater prevalence of TMD than men. A systematic

review and meta-analysis of adult population-based studies found that women had approximately twice the odds of presenting with TMD compared with men across several diagnostic groups [5]. This sex difference may involve biological, hormonal, psychosocial, behavioral, and pain-processing mechanisms, although the precise contribution of each factor remains incompletely understood.

The etiology of TMD is considered multifactorial. Biological and structural factors may interact with psychological, behavioral, and environmental factors to influence the onset and persistence of symptoms. Research from the OPPERA programme demonstrated associations between TMD and altered pain sensitivity, psychosocial characteristics, and other individual risk factors [6] [7]. Parafunctional behaviors, including tooth clenching and other repetitive jaw-loading activities, have received considerable attention in the literature. Although the relationship between individual parafunctional activities and TMD is complex, behavioral factors may contribute to increased mechanical loading and pain-related symptoms in susceptible individuals [7].

Temporomandibular disorders (TMDs) comprise a group of conditions affecting the temporomandibular joint, masticatory muscles, and associated structures. They may present with pain, joint sounds, altered mandibular movement, and functional limitations. Their development is multifactorial, involving structural, inflammatory, mechanical, behavioral, and psychosocial factors. Understanding these factors and the varied clinical manifestations of TMDs is important for accurate diagnosis and appropriate management [8].

The study by Zwiri and Al-Omiri among university students in northern Saudi Arabia found that almost half of participants reported at least one TMD sign or symptom, with clicking being the most frequently reported finding. [9] TMD was highly prevalent among students at the University of Jordan, particularly among those studying health and science-related disciplines, suggesting a potential association between academic stress and the development or progression of TMD [10].

A prevalence of 68% has been reported among participants, with women being more frequently affected. Commonly observed signs and symptoms included articular sounds and pain on palpation of the masticatory, cervical, and scapular-girdle musculature [11].

The Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) provides validated clinical examination and questionnaire-based criteria for diagnosing the most common TMDs, while also incorporating assessment of psychosocial and behavioral factors that may influence their onset and persistence [12].

The current burden of TMD, population surveys investigating painful conditions affecting the head and neck area In European and North American societies have reported that TMD was ranked second to headache. For every 100,000,000 full time workers in the US, TMD accounts for the loss of 17,800,000 workdays [13].

Temporomandibular disorders comprise a diverse group of conditions affect-

ing the temporomandibular joints and masticatory muscles, with clinical manifestations that may include pain, joint sounds, and altered mandibular movements [14].

Despite the considerable international literature concerning TMD, there is limited published epidemiological information concerning the prevalence and clinical characteristics of TMD among patients in the Maldives. Establishing local baseline data is important because prevalence estimates obtained from other countries cannot necessarily be extrapolated directly to the Maldivian population.

Therefore, the present study was undertaken to determine the prevalence of TMD among patients reporting to Indira Gandhi Memorial Hospital in Malé, Maldives, and to describe the principal clinical findings associated with TMD in this population.

2. Aim

To determine the prevalence of temporomandibular disorders among patients reporting to Indira Gandhi Memorial Hospital, Malé, Maldives.

Objectives

- 1) To determine the proportion of patients presenting with clinical findings consistent with TMD.
- 2) To describe the distribution of TMD according to sex.
- 3) To determine the frequency of major clinical findings, including pain, clicking, crepitus, mandibular deviation/deflection, and parafunctional habits.
- 4) To describe the age distribution of participants and TMD-positive patients.
- 5) To provide baseline epidemiological data that may assist future TMD research and clinical management in the Maldives.

3. Materials and Methods

3.1. Study Design

A descriptive prospective observational study was undertaken among patients attending Indira Gandhi Memorial Hospital, Malé, Maldives.

The study was designed to describe the prevalence of clinical TMD findings in a hospital-based patient population. The study followed the general clinical principles used in contemporary TMD assessment, with reference to established diagnostic frameworks including the DC/TMD.

3.2. Study Setting

The study was conducted at **Indira Gandhi Memorial Hospital (IGMH), Malé, Maldives**, with recruitment through the Department of Oral and Maxillofacial Surgery and relevant clinical services.

3.3. Study Population

The study population consisted of adult patients meeting the eligibility criteria

and consenting to participate.

The original protocol planned approximately 385 participants. The final dataset available for analysis contained **384 participants**.

3.4. Eligibility Criteria

Inclusion criteria

- Eligible adult patients attending the relevant IGMH clinical services during the study period were enrolled after providing consent and were subsequently clinically assessed for TMD-related symptoms and signs. Participants were classified as TMD-positive only after the clinical assessment according to the study's predefined clinical criteria.
- Adults aged 18 - 69 years.
- Patients not already undergoing treatment specifically for TMD.

Exclusion criteria

- Previous TMJ surgery.
- Age below 18 years or above 69 years.
- Patient refused to give consent
- Patients receiving steroids or sedative medications where these were considered likely to interfere with assessment.

3.5. Definition of TMD in the Present Study

For the present analysis, participants were classified as TMD-positive when they demonstrated clinical findings meeting the operational clinical definition used in the study protocol.

Operational definition of TMD positive:

Participants were classified as TMD-positive- when clinical assessment identified one or more findings suggestive of temporomandibular disorder involving the temporomandibular joints and/or the muscles responsible for mastication and mandibular function. Relevant clinical findings included pain or tenderness, joint sounds such as clicking or crepitus, and/or dysfunction or abnormal mandibular movement during jaw opening and closing. Participants without these relevant clinical findings were classified as TMD-negative.

3.6. Structured History and Clinical Assessment

Following enrolment, each participant underwent a structured history and clinical examination performed personally by the principal investigator (Myself).

The history included:

Questions regarding TMD-related symptoms, including pain and symptoms associated with jaw function, as well as parafunctional habits such as clenching, grinding, and other relevant oral habits.

Clinical examination included: Inspection of mandibular movements for deviation or deflection during mouth opening and closing, palpation of the temporomandibular joints and relevant masticatory structures, and auscultation for tem-

poromandibular joint sounds such as clicking and crepitus. Maximum mouth opening was assessed using a measuring scale. Clinical evidence of tooth attrition was also assessed as an additional indicator of parafunctional activity. The findings obtained from history and clinical examination were considered together for the overall clinical assessment of TMD status. All examinations were performed by me throughout the study; therefore, inter-examiner variability was not applicable.

The DC/TMD framework emphasizes standardized history-taking and physical examination for TMD assessment and distinguishes pain-related disorders from intra-articular disorders [1].

Where applicable, pain severity was recorded using a Numeric Rating Scale.

Because this was a clinical observational study rather than an imaging-based diagnostic study, the results should be interpreted as **prevalence of clinically identified TMD**, rather than prevalence of every specific intra-articular pathology.

This distinction is important because some intra-articular TMD diagnoses cannot be definitively established from clinical examination alone and may require imaging for confirmation [12].

3.7. Sample Size

The original protocol estimated a sample size of approximately 385 using:

$$N = D2Z2PQ$$

using an anticipated prevalence of 50%, 95% confidence level, and 5% allowable error.

The final number of participants available for analysis was **384**.

3.8. Statistical Analysis

Data were analyzed using appropriate statistical software.

Descriptive statistics were used to summarize demographic characteristics and TMD findings. Categorical variables were summarized using frequencies and percentages.

The prevalence of TMD was calculated as:

$$\text{Prevalence} = (\text{Number of TMD – positive participants} / \text{Total number of participants}) \times 100^* = (142/384) \times 100 = 36.98\%, \text{ approximately } 37.0\%^*.$$

Table 1. Prevalance of TMJD positive patients.

Variables	Total patients (%)	TMD + VE	TMD (–ve) (%)
Prevalence	384	142 (37%)	242 (63%)

Among the 384 participants, 142 were classified as TMD as presented above in **Table 1**. Patients corresponding to overall prevalence of 37%, while 242 patients did not meet the criteria to be classified as TMD positive patients, so they are

considered as TMD negative patients.

4. Results

4.1. Demographic Characteristics

Age distribution and age-specific TMD prevalence:

Among the 384 study participants, below **Table 2** shows, 52 (13.5%) were aged 18 - 24 years, 65 (16.9%) were aged 25 - 34 years, 76 (19.8%) were aged 35 - 44 years, 92 (24.0%) were aged 45 - 54 years, 63 (16.4%) were aged 55 - 64 years, and 36 (9.4%) were aged 65 - 70 years. The number of TMD-positive participants in these age groups was 31, 30, 27, 32, 18, and 4, respectively. The corresponding age-specific prevalence of TMD was 59.6%, 46.2%, 35.5%, 34.8%, 28.6%, and 11.1%, respectively.

Table 2. Distribution of patients by age.

Variables	Total patients	TMD + ve
Age (years)		
18 - 29	84	51 (35.91%)
30 - 39	71	29 (20.40%)
40 - 49	102	33 (23.2%)
50 - 59	79	20 (14.08%)
60 - 69	48	9 (6.33%)
Total	384 (100%)	142 (100%)

Table 2 shows the distribution of 384 patients according to age. The largest group was 40 - 49 years (102 patients, 26.5%) followed by 18 - 29 years (84 patients, 21.88%) being the smallest group 60 - 69 years (48 patients 12.5%). The highest number of TMJD + ve was seen in 10 - 29 years group (51 patients 35.9%) while the lowest was in the 60 - 69 age group (only 9 patients).

Table 3. Distribution of Patients by genders (TMD positive patients).

Variables	Frequency	Percentage
Gender		
Male	44	30.9
Female	98	69.01
Total	142	100

Table 3 shows the prevalence of TMJD was significantly higher among females, compared to males. Among the 142 (37.0%) TMD-positive patients, it was identified as 98 were female participants (41.5%) and 44 were found to be male participants (29.7%). The prevalence of TMD was significantly higher among females than males ($\chi^2 = 5.43$, $df = 1$, $p = 0.020$). The prevalence ratio for females compared with males was 1.40 (95% CI: 1.04 - 1.87).

A chi-square test demonstrated a statistically significant association between sex and TMD status ($\chi^2 = 5.43$, $df = 1$, $p = 0.020$). The prevalence ratio for females compared with males was 1.40 (95% CI: 1.04 - 1.87), indicating that the prevalence of TMD was approximately 40% higher among female participants.

Females therefore demonstrated a higher proportion of clinically identified TMD than males. This observation is consistent with previous epidemiological research and systematic-review evidence demonstrating greater TMD prevalence among women [5].

4.2. Clinical Findings among TMD-Positive Participants

Table 4. Clinical findings among TMD-positive participants.

Character	Frequency of patient	Percentage
clicking	113	79.6
pain	109	76.8
Deviation/Deflection	88	62
Crepitation	52	36.6

Above mentioned **Table 4** shows, Clicking was observed in **113/142 (79.6%)** TMD-positive participants. Pain was present in **109/142 (76.8%)**, making pain the second most frequent finding.

Deviation/deflection was observed in 88 patients (62.0%), while crepitus was recorded in 52 (36.6%). Parafunctional habits were reported in 37 participants (26.1%).

5. Discussion

The present study identified clinically apparent TMD in **142 of 384 participants, corresponding to a prevalence of 37.0%**. This finding indicates that TMD-related signs and symptoms constitute a substantial clinical problem among patients attending IGMH.

Deviation or deflection during mandibular opening was observed in **62.0%** of TMD-positive participants. Alterations in mandibular movement may accompany a range of TMJ and masticatory-system disorders. Nevertheless, deviation is a clinical sign rather than a standalone diagnosis. Its interpretation should therefore be combined with the patient's history, pain findings, joint sounds, range of motion, and other examination findings [1].

The modern DC/TMD approach emphasizes that TMD is not a single disorder but encompasses multiple pain-related and intra-articular conditions [1] [2]. Similar to the study by Dworkin SF *et al.*, the present study also incorporated both patient history and clinical examination for the assessment of temporomandibular disorder (TMD). While the previous study evaluated TMD symptoms using a self-administered questionnaire followed by clinical examination of TMJ sounds, mandibular movements, and tenderness of the TMJ and masticatory muscles, the

present study likewise considered history-based symptoms together with clinical findings to identify TMD [3].

Comparison with published prevalence estimates must be undertaken carefully because TMD prevalence varies according to study population, sampling methodology, diagnostic criteria, and whether the outcome represents symptoms, clinical signs, or a specific TMD diagnosis [4].

In this study, Younger people (59.6%) compared to elderly were found to be more prevalent, which is consistent with the study by Ligia Figueiredo Valesan *et al.*, where 31% of adults were affected compared to elderly patients which was more than elderly patients [4].

A notable finding in the present study was the greater prevalence of TMD among females. TMD was identified in **69.01% of female participants compared with 30.9% of male participants**. This observation agrees with the wider epidemiological literature. Bueno *et al.*, in a systematic review and meta-analysis, found that women had higher prevalence across several TMD diagnostic groups, with approximately twofold greater odds of TMD compared with men [5]. Several explanations have been proposed for this sex difference, including hormonal influences, differences in pain perception and modulation, psychosocial factors, and behavioral characteristics. However, the mechanisms are multifactorial and should not be reduced to a single explanation [5].

Parafunctional habits were observed in 26.1% of TMD-positive participants in the present study. This finding is consistent with the study by Greenspan JD *et al.* [6], which reported an association between parafunctional behavior and TMD. However, the relationship between parafunctional behavior and TMD is considered multifactorial, involving behavioral, biological, psychosocial, and pain-processing factors. Therefore, the presence of parafunctional habits in a proportion of TMD-positive participants in the present study may represent one contributing factor within this broader multifactorial framework. The OPPERA investigations have demonstrated that TMD risk involves multiple domains, including pain sensitivity and psychosocial characteristics [6] [7]. These findings support the contemporary view that TMD should be approached as a multifactorial musculoskeletal pain condition rather than being attributed exclusively to occlusion or a single mechanical factor.

The multifactorial nature of TMDs may help explain the findings of the present study. Clinically apparent TMD was identified in 37.0% of participants, with pain, clicking, and deviation/deflection being frequently observed among TMD-positive patients. Similar findings were reported by Wang, X.D. *et al.* [8] who also identified pain and joint sounds as common clinical manifestations of TMD. The higher prevalence among females (41.5%) compared with males (29.7%) is also consistent with the findings of [Author *et al.*], suggesting that multiple biological, mechanical, behavioral, and psychosocial factors may contribute to the clinical expression of TMDs rather than a single causative mechanism [8].

Zwiri and Al-Omiri reported that **49.7%** of university students in northern

Saudi Arabia had at least one TMD sign or symptom, with clicking being the most frequently reported finding [9]. The somewhat lower prevalence observed in the current study may reflect differences in population characteristics, clinical setting, age distribution, and—particularly—the criteria used to classify a participant as TMD-positive.

Clicking was the most common finding in the present study, occurring in **79.6% of TMD-positive participants**. This is consistent with previous epidemiological investigations in which TMJ clicking has been among the most frequently identified clinical findings [9] [10]. However, the presence of clicking should not automatically be equated with a painful TMD diagnosis.

A clicking joint may occur in individuals without clinically significant pain or disability. Consequently, the current finding should be interpreted as a high frequency of clicking among participants classified as TMD-positive rather than as evidence that every clicking joint represented clinically significant joint disease. The prevalence observed in the present study is broadly comparable with findings from several previous investigations. Studies among university students and other populations have reported substantial frequencies of TMD signs and symptoms. Pedroni *et al.* reported a considerable prevalence of TMD signs and symptoms among Brazilian university students, while Ryalat *et al.* similarly documented TMD-related findings among students in Jordan [10] [11].

Pain was reported in **109 of 142 TMD-positive participants (76.8%)**. Pain is clinically important because it is one of the major reasons individuals seek treatment for TMD. Contemporary diagnostic approaches specifically distinguish pain-related TMD from non-painful joint findings [12]. The relatively high frequency of pain in this study may be partly related to the hospital-based nature of the sample, because individuals attending a tertiary hospital may be more likely to seek care for symptomatic conditions than asymptomatic members of the general population.

Crepitus was identified in **36.6%** of TMD-positive participants. Crepitus differs clinically from clicking and may suggest degenerative changes within the TMJ. However, definitive characterization of intra-articular pathology may require imaging, particularly where a specific structural diagnosis is clinically suspected [12].

The prevalence of TMD in the present study (37.0%) is comparable to that reported by Zieliński *et al.* [13], who found prevalence estimates of 47% in South America, 33% in Asia, and 29% in Europe. These geographical differences suggest that location may influence the observed prevalence of TMDs, although variations in population characteristics and assessment methods may also contribute to the differences.

The clinical manifestations identified in the present study, particularly pain, clicking, deviation or deflection, and crepitus, are consistent with the range of signs and symptoms described in previous literature on TMD [14]. This supports the view that TMD represents a heterogeneous group of conditions that may present through different combinations of pain and functional or joint-related find-

ings.

The findings of this study have several clinical implications.

First, the identification of TMD in approximately **37%** of the study population indicates that clinicians working in oral and maxillofacial and general dental settings should maintain a high index of suspicion for TMD-related symptoms.

Second, the high frequency of clicking and pain suggests that a focused TMJ history and clinical examination may identify a substantial number of patients who otherwise might not receive a specific TMD assessment.

Third, the greater prevalence among females is consistent with international epidemiological evidence and may justify particular attention to TMD symptoms in female patients presenting with compatible complaints.

Finally, standardized diagnostic approaches such as DC/TMD can improve consistency in clinical assessment and facilitate comparison between future Maldivian studies and international research.

Strengths of the Study

The present study has several strengths.

- 1) It provides **local epidemiological data from the Maldives**, where published TMD prevalence data are limited.
- 2) A relatively large clinical sample of **384 participants** was evaluated.
- 3) Both subjective symptoms and objective clinical findings were considered.
- 4) Multiple clinical findings—including pain, clicking, crepitus, deviation/deflection, and parafunctional habits—were documented.
- 5) The findings can provide a baseline for future prospective and population-based TMD research in the Maldives.

Limitations

Several limitations should be considered.

- 1) The study was conducted in a hospital-based population rather than a randomly selected community sample. Therefore, the prevalence observed cannot necessarily be generalized to the entire Maldivian population.
- 2) Convenience sampling may introduce selection bias.
- 3) TMD is a heterogeneous group of disorders, and the use of clinical findings rather than comprehensive imaging-based assessment means that specific intra-articular diagnoses cannot necessarily be confirmed. Modern DC/TMD guidance recognizes that some intra-articular conditions require imaging for definitive diagnosis [12].
- 4) Some participants may have had incomplete clinical information. Missing observations should be reported transparently rather than estimated or replaced.
- 5) Because the study is observational and cross-sectional in its analysis, associations between clinical findings and TMD should not be interpreted as proof of causality.

6. Conclusion

The present study found that 142 out of 384 patients (37.0%) attending IGMH were clinically diagnosed with temporomandibular disorders (TMD). Younger individuals showed a higher prevalence of TMD compared to older patients. In terms of sex differences, females demonstrated a greater prevalence of TMD than males, with a higher proportion of females affected. Among the TMD-positive participants, the most frequent clinical signs were joint clicking and pain, followed by mandibular deviation or deflection, crepitus, and parafunctional habits.

These results emphasize the notable presence of TMD among younger patients, particularly females, highlighting the importance of early detection and tailored treatment approaches for these vulnerable groups.

Future research should use standardized DC/TMD diagnostic protocols and, where indicated, imaging and psychosocial assessment to determine the distribution of individual TMD diagnoses and their associated risk factors in the Maldivian population.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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