RESEARCH PAPER

Temporomandibular Disorders in Dentulous and Partially Dentulous Patients Having Reduced Lower Facial Height

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Received: 15th Jul, 2026 | Revised: 25th Jul, 2026 | Accepted: 5th Aug, 2026 | Available Online: 12th Aug, 2026

ABSTRACT

Background: Temporomandibular disorders (TMDs) affect the temporomandibular joint, masticatory muscles, and associated structures. Reduced lower facial height may alter occlusal relationships and joint function.

Objective: To assess and compare the frequency and severity of TMDs among dentulous and partially dentulous patients with reduced lower facial height.

Methods: A descriptive cross-sectional study was conducted at the Department of Prosthodontics, Institute of Dentistry, Liaquat University of Medical and Health Sciences, Jamshoro/Hyderabad. 316 patients were recruited through non-probability consecutive sampling. Assessment included functional history, resting and occlusal vertical dimensions, joint examination, and masticatory muscle palpation. TMD severity was assessed using a visual analogue pain scale.

Results: The mean age was 53.11 years. TMD occurred in 53.2% of participants. TMJ pain (67.1%) and clicking (53.5%) were the most frequent findings, while masseter (80.1%) and temporalis (72.5%) tenderness were common. Mild pain was reported by 55.7%. TMD was significantly associated with dentulous status (P=0.001).

Conclusion: TMD was common among patients with reduced lower facial height and was significantly associated with partially. Comprehensive assessment may facilitate management.

Keywords: Temporomandibular disorders; reduced lower facial height; dentulous; partially dentulous; temporomandibular joint; prosthodontics.

How to cite this article: Ghulam Zuhra1* Mariam Fatima2 Shagufta Channa3 Dr. Ishrat Begum4 Dr. Alvina Ali5 Dr. Aamir Mehmood Butt6 Dr. Mehak Memon7. Temporomandibular Disorders in Dentulous and Partially Dentulous Patients Having Reduced Lower Facial Height. Int J Drug Deliv Technol. 2026;16(78s):772-777. DOI: 10.25258/ijddt.16.78s.89.

Introduction

Temporomandibular disorders (TMDs) are a diverse array of musculoskeletal conditions affecting the temporomandibular joints (TMJs), masticatory muscles, and supporting structures. They are frequently characterized by jaw or preauricular pain, tenderness muscle, joint clicks or crepitus, and limitation in mandibular movement and masticatory function. TMD is a multifactorial disorder, and its pathogenesis can be related to biomechanical, neuromuscular, biological factors as well as psychosocial factors. Symptoms may occur or persist for reasons such as occlusal overloading, parafunctional habits like bruxism, tooth wear, and changes in vertical dimension of occlusion (1, 2).

Definition of reduced lower facial height is a vital clinical issue, especially in prosthodontics, which may indicate a lack of proper occlusal support and vertical dimension. Secondary to progressive tooth attrition, tooth loss, and alveolar bone resorption can develop. Attrition and other forms of tooth wear can gradually reduce OVD in dentulous patients, whereas partially dentulous patients lose posterior support with multiple tooth loss. These modifications can change the positioning of the mandible, occlusal stability, and prepare a new biomechanical relationship between the dentition, masticatory muscles, and TMJs (3, 4).

Considering that the relationship between reduced vertical dimension and TMD is clinically relevant due to its potential effects on condylar position and loading

of the temporomandibular joint, it would be better if more details regarding treatment (ie, amount of interocclusal space) are reported (5). Loss of posterior teeth could give rise to axial instability, while diminished OVD may additionally increase functional demands on the masticatory musculature. Therefore, patients with impaired vertical facial dimensions may present joint pain, muscle fatigue, joint sounds, and limited mandibular movements. Restoration of vertical dimension has been discussed in the dissertation literature as one of the factors that need to be appropriately addressed during prosthodontic rehabilitation (6).

Decreased lower facial height may also hold functional implications. OVD can adversely affect masticatory efficiency and change the distribution of occlusal forces, whereas loss of posterior teeth might inhibit chewing and also compromise functional stability. Thus, from a prosthodontic stance, the identification of decreased lower facial height is critical during evaluation for tooth replacement or rehabilitation. A better understanding of its engagement with TMD might enable clinicians to assess patients at higher odds of temporomandibular dysfunction and derive more suitable therapeutic approaches (7).

TMD and occlusal factors have been widely studied, but the relationship between decreased lower facial height in dentulous and partially dentulous patients and TMD has not yet been fully assessed. This allows for direct comparisons between the groups, which can ultimately inform a clinically relevant understanding of how frequently and severely TMD occurs in patients with reduced vertical dimensions. Hence, the present study was carried out to evaluate and compare the prevalence and severity of TMDs in dentulous and partially dentulous patients with reduced lower facial height.

Methodology

Study Design and Setting

This was a descriptive cross-sectional study that lasted for 6 months from 26 June 2025 at the Prosthodontics Outpatient Department (OPD), Institute of Dentistry, Liaquat University of Medical and Health Sciences (LUMHS)—Jamshoro/Hyderabad, Pakistan. The purpose of the study was to evaluate and compare the prevalence and severity of temporomandibular disorders (TMDs) in dentulous and partially dentulous patients exhibiting decreased lower facial height. The study protocol was approved by the institutional review committee of LUMHS and the College of Physicians and Surgeons Pakistan (CPSP), Ethical Review Committee (ERC) approval number LUMHS/REC/-98 dated 12 July 2023.

Study Population

The study group included patients aged 18–65 years attending the dental OPD, specifically those who reported to our department for replacement of missing teeth. The study included dentulous and partially dentulous individuals with objectively measured lower facial height reduction. Informed consent, communication, and clinical evaluation were prerequisites for participants. If a subject was completely edentulous or had normal lower facial height, they were excluded from the study. Furthermore, patients with debilitating systemic conditions that can impact the temporomandibular joint or facial height (rheumatoid arthritis and connective tissue disorders) would be excluded from our study. Participants were excluded if they were incapable of consenting, had insufficient verbal communication, or were not available for evaluation.

Sample Size and Sampling Technique

Sample size was determined using the OpenEpi online calculator version 3.01. Power calculations assumed that the expected prevalence of temporomandibular dysfunction was 29% (8), with a confidence limit of 5% (50% in each arm), a population size of 1,000,000, and a design effect = 1. This led to a minimum sample size of 316 participants. A non-probability consecutive sampling method was used to recruit participants.

Data Collection

Eligible patients visiting the Prosthodontics OPD were approached after obtaining ethical approval and were provided with an explanation of the purpose of the study, procedures to be followed, and their rights as participants, along with potential risks and benefits. Written consent was obtained from the participants, and their data were collected anonymously. Data were obtained through an interview and a clinical examination of the stomatognathic system.

Clinical evaluations of jaw pain, audible clicks upon opening and closing, and limited mouth opening and other manifestations of TMD. Intraoral examination utilising a mouth mirror, measurement of lower facial height and mandibular opening using a metal ruler, and joint sounds assessed by stethoscope. Bilateral palpation of the masseter and temporalis muscles with digital pressure; checking intraorally for tenderness from lateral and medial pterygoid muscles. For tenderness, both TMJs were palpated laterally and posteriorly during the opening and closing of the mandible to detect missed movements. Crepitation and clicking were assessed by palpating and auscultating the joint with a stethoscope.

Interincisal distance was recorded to the nearest millimeter. Reduced opening capacity was defined as vertical mouth opening <40 mm and lateral movement <10 mm, whereas mandibular deviation of 2 mm or more during opening was recorded as such. Freeway space was subsequently measured and then RVD and OVD to determine reduced lower facial height. Stratification was used as a method to control for potential biases and confounders.

Outcome Measures

The main outcome was TMD in dentulous or partially dentulous patients who had a reduced lower facial height. Secondary clinical outcomes: Individual TMD-related pain (four scales), clicking, crepitus, locking of the TMJ, questionnaires for mandibular deviation and restricted movement from one period to another (ranging from three days to two weeks) at follow-up appointment on tenderness of the masseter.Temporalis. Lateral pterygoid muscle.Medial pterygoid muscle. The established VAS categories were used to assess the intensity of pain severity.

Statistical Analysis

Data were analyzed with IBM SPSS Statistics version 22.0. Shapiro–Wilk test was used to check normality. We summarized continuous variables (age, weight, RVD, OVD, and freeway space) as mean with standard deviation or median with interquartile range where appropriate. Frequencies and percentages were used to display categorical variables.

For dentulous and partially dentulous participants, the chi-square test was applied to compare the frequency of TMD. In order to determine whether any of these potential effect modifiers influenced masticatory muscle tenderness, we conducted stratified analyses by age, sex (male vs female), diabetes mellitus (yes vs no), hypertension (yes vs no), and work status. A two-sided P value ≤0.05 was deemed statistically significant.

Results

Baseline Demographic, Clinical, and Vertical-Dimension Characteristics

We included 316 patients with reduced lower facial height. The mean age was 53.11 ± 8.53 years, and the average weight was 68.68 ± 6.61 kg. Among the cohort, 52% were females. Diabetes mellitus and hypertension were reported in 42.4% and 50.3% of the participants, respectively. Mean resting vertical dimension (RVD) was 59.13 ± 4.64 mm, and the mean occlusal vertical dimension (OVD) was measured to be 53.99 ± 4.46 mm; thus, the overall freeway space was found to be constricted at a mean of 5.37 ± 1.38 mm [8U]. Dental attrition was shown in around 50% of subjects, and partial dentition was present in 47.2% (upper arches) and 50.6% (lower arches). Table 1.

Table 1. Baseline demographic, systemic, occlusal, and vertical-dimension characteristics

Characteristic	Overall (N=316)
Demographic characteristics	
Age, years, mean ± SD	53.11 ± 8.53
Age range, years	25–72
Weight, kg, mean ± SD	68.68 ± 6.61
Female sex	163 (51.6)
Male sex	153 (48.4)
Occupational status	
Housewife	138 (43.7)
Private employment	65 (20.6)
Government employee	25 (7.9)
Retired	26 (8.2)
Business	21 (6.6)
Labor	20 (6.3)
Doctor	15 (4.7)
Student	3 (0.9)
No occupation	3 (0.9)
Systemic characteristics	
Diabetes mellitus	134 (42.4)
Hypertension	159 (50.3)
Occlusal characteristics	
Dentulous with attrition	161 (50.9)
Partially dentulous, upper arch	149 (47.2)
Partially dentulous, lower arch	160 (50.6)
Vertical-dimension measurements	
Resting vertical dimension, mm	59.13 ± 4.64
Occlusal vertical dimension, mm	53.99 ± 4.46
Freeway space, mm	5.37 ± 1.38

Values are presented as n (%) unless otherwise indicated.

Functional Symptoms and Clinical Temporomandibular Findings

Functional manifestations were frequent. Difficulty opening the mouth widely was reported by 57.3%, jaw-joint pain by 61.7%, and discomfort during chewing of hard foods by 59.5%. On clinical examination, TMJ pain was identified in 67.1%, while clicking occurred in 53.5%. Masticatory muscle tenderness was particularly prominent in the masseter (80.1%) and temporalis (72.5%). Overall, 53.2% of participants fulfilled the study-defined criteria for TMD. Mild pain was the predominant severity category (55.7%), whereas severe pain was present in 8.5%. Table 2.

Table 2. Functional symptoms, temporomandibular findings, muscle tenderness, and TMD severity

Clinical characteristic	n (%)
Functional symptoms	
Difficulty opening mouth widely	181 (57.3)
Jaw-joint pain	195 (61.7)
Ear/temple/cheek pain	174 (55.1)
Joint noises	134 (42.4)
Discomfort chewing hard/tough food	188 (59.5)
Nighttime clenching/grinding	104 (32.9)
TMJ function	
TMJ pain	212 (67.1)
Clicking	169 (53.5)
Crepitation	49 (15.5)
Jaw locking	19 (6.0)
Mandibular deviation ≥2 mm	107 (33.9)
Vertical interincisal distance <40 mm	136 (43.0)
Lateral interincisal distance <10 mm	105 (33.2)

Masticatory muscle tenderness	
Masseter	253 (80.1)
Temporalis	229 (72.5)
Lateral pterygoid	144 (45.6)
Medial pterygoid	78 (24.7)
Overall TMD status	
TMD present	168 (53.2)
TMD absent	148 (46.8)
Pain severity	
No pain	53 (16.8)
Mild (VAS 1–3)	176 (55.7)
Moderate (VAS 4–6)	60 (19.0)
Severe (VAS 7–10)	27 (8.5)

VAS, visual analogue scale. Values are presented as n (%).

Figure 1. Clinical profile of temporomandibular dysfunction: Masticatory muscle tenderness was the most frequent finding, particularly in the masseter (80.1%) and temporalis (72.5%), followed by TMJ pain (67.1%) and jaw-joint pain (61.7%). Crepitus (15.5%) and jaw locking (6.0%) were less frequently observed.

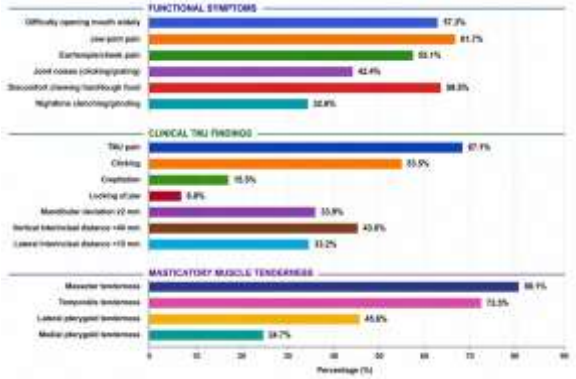

Figure 1. Clinical spectrum of temporomandibular dysfunction

Factors Associated With Temporomandibular Disorders

TMD was significantly associated with age group (P=0.001) and dentition status (P=0.001). Participants aged 51–60 years accounted for the largest proportion of TMD cases. Among partially dentulous participants, 64/78 (82.1%) had TMD compared with 104/238 (43.7%) of dentulous participants, demonstrating a marked difference between the two groups. Gender, diabetes mellitus, and occupational status were not significantly associated with TMD.

Table 3. Association of TMD with demographic, systemic, occupational, and dentition characteristics

Variable	TMD present, n (%)	TMD absent, n (%)	*P* value
Age group, years			**0.001**
25–40	0 (0.0)	6 (1.9)	
41–50	21 (6.6)	30 (9.5)	
51–60	127 (40.2)	81 (25.6)	
>60	20 (6.3)	31 (9.8)	
Sex			0.098
Male	74 (23.4)	79 (25.0)	
Female	94 (29.7)	69 (21.8)	
Diabetes mellitus			0.529
Yes	74 (23.4)	60 (19.0)	
No	94 (29.7)	88 (27.8)	
Occupational status			0.218
Housewife	70 (22.2)	68 (21.5)	
Private employment	41 (13.0)	24 (7.6)	
Doctor	10 (3.2)	5 (1.6)	
Government employee	9 (2.8)	16 (5.1)	
Labor	11 (3.5)	9 (2.8)	
Business	10 (3.2)	11 (3.5)	
Retired	17 (5.4)	9 (2.8)	
Other	0 (0.0)	6 (1.9)	
Dentition status			**0.001**
Partially dentulous	64 (82.1)	14 (17.9)	
Dentulous	104 (43.7)	134 (56.3)	

Values are presented as n (%). P values are from the reported chi-square analyses.

Figure 2. TMD prevalence according to dentition status: TMD was substantially more frequent among partially dentulous patients (82.1%) than among dentulous patients (43.7%), demonstrating a statistically significant association between dentition status and TMD (P=0.001).

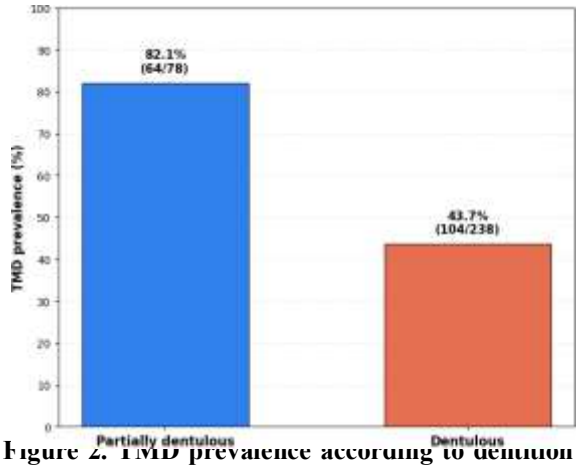

Figure 2. TMD prevalence according to dentition status

Discussion

The present study demonstrated a substantial burden of temporomandibular disorders (TMDs) among patients with reduced lower facial height, with 53.2% fulfilling the study-defined criteria for TMD. The predominant clinical manifestations were masticatory muscle tenderness, TMJ pain, and clicking. Importantly, dentition status showed a strong association with TMD, with prevalence substantially higher among partially dentulous patients than among dentulous patients. The high incidence of TMD in this cohort is clinically important as all individuals had decreased lower facial height. The average resting vertical dimension was 59.13 ± 4.64 mm as opposed to an occlusal vertical dimension of 53.99 ± 4.46 mm, rendering a mean freeway space of 5.37 ± 1.38 mm. Also, nearly half of the participants experienced attrition or only partial dentition. This supports the existence of considerable occlusal and vertical-dimensional changes in the population examined in the study.

The most significant symptoms were reported tenderness in masticatory muscles, including masseter (80.1%) and temporalis (72.5%). TMJ pain in 67.1% and clicking in 53.5%. Functional complaints were also quite prevalent, with difficulty in wide mouth opening (57.3%), pain around the jaw joint (61.7%), and discomfort while chewing hard foods (59.5%). These findings indicate that the clinical burden was multi-factorial in nature and included not only isolated joint symptoms but also muscular and functional components of the stomatognathic system (9, 10). The prominent tenderness of the muscular component may have occurred in particular patients treated by prosthodontic rehabilitation. Changes in vertical dimension and occlusal support can affect postures of the mandible and functional objectives on masticatory muscles. The cross-sectional nature of the data does not allow for determination of causality, but suggests that masticatory muscle function should be carefully evaluated in patients with reduced lower facial height.

There was a statistically significant association between dentition status and TMD. TMD was found in 64 of 78 partially dentulous patients (82.1%) as opposed to finding it in 104 of the 238 dentulous patients (43.7%) P=0.001). Such a large disparity suggests that overhead may identify patients with increased burden of temporomandibular dysfunction participating in the ambience of compromised lower facial height. However, this association should not be interpreted as evidence that partial edentulism is the cause of TMD. Instead, tooth loss might be associated with other aspects such as edentulism duration and pattern, occlusal instability, tooth wear, and parafunctional activity that were not thoroughly assessed (11-13).

The results are in line with the discussion of the major findings presented and discussed in the thesis, although more variable reports on dentition/TMD relationship can be found for previous studies. Studies have reported disparities in TMD frequency among subjects with natural teeth, removable partial dentures, and complete dentures (14). Such differences may be attributed to variability in the patterns of tooth loss, prosthetic support, occlusal stability, patient features, and measurement methods among different studies. Denton status should thus be interpreted as one variable in a multifactorial pathway involving many other factors, rather than an isolated determinant of TMD (15, 16).

Results of a multivariate logistic regression analysis revealed that age was the most important predictor for TMD (P = 0.001), with the highest accumulation of TMD cases between participants aged from 51–60 years. Such patterns could be indicative of cumulative alterations in dentition, wear patterns, occlusal ratio relationships and functional changes through time (17). However, because the analysis in this report was not multivariable, the independent effect of age is unknown.

No statistically significant association was observed between TMD and sex (*P*=0.098), diabetes mellitus (*P*=0.529), or occupational status (*P*=0.218). Pain severity was predominantly mild, with 55.7% reporting mild pain, 19.0% moderate pain, and 8.5% severe pain. The predominance of mild symptoms nevertheless emphasizes the importance of identifying early clinical manifestations during routine prosthodontic assessment (18).

This study has several strengths, including a relatively large sample of 316 participants, focused assessment of patients with reduced lower facial height, and evaluation of both functional symptoms and clinical signs. The comparison between dentulous and partially dentulous groups provides clinically relevant information for prosthodontic practice.

The findings should be interpreted in light of important limitations. The cross-sectional design prevents determination of temporal or causal relationships. Furthermore, the study did not use standardized diagnostic criteria such as DC/TMD or RDC/TMD, and therefore the reported prevalence represents clinically defined TMD according to the study protocol. The dissertation also identifies the absence of a control group as a limitation. Future prospective studies using standardized diagnostic protocols and detailed assessment of tooth-loss pattern, duration of edentulism, prosthetic status, parafunctional activity, and vertical-dimension changes are warranted.

Conclusion

TMDs were common among patients with reduced lower facial height, affecting 53.2% of participants. Masticatory muscle tenderness, TMJ pain, and

clicking were the predominant clinical findings. Partially dentulous patients demonstrated a substantially higher TMD prevalence than dentulous patients (82.1% vs. 43.7%; *P*=0.001).

Funding

The authors received no external funding for this study.

Informed Consent

Written informed consent was obtained from all participants before enrollment in the study.

Conflict of Interest

The authors declare that they have no competing interests.

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