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A Retrospective Study of the Treatment Outcomes of Patients with Temporomandibular Joint Disorders (TMD) at the College of Dentistry, Bilad Alrafidain University

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Abstract: Temporomandibular Dysfunction comprises a group of musculoskeletal and neuromuscular disorders affecting the temporomandibular joint, masticatory muscles, and associated structures. This study aims to evaluate the clinical characteristics, treatment modalities, and outcomes of patients with Temporomandibular Dysfunction (TMD) at the College of Dentistry, Bilad Alrafidain University (BAUC). This retrospective observational study was conducted on 60 patients diagnosed with temporomandibular joint dysfunction (TMD) at the College of Dentistry, BAUC, Diyala, Iraq. Ethical approval was obtained from the College of Dentistry Research Committee. Data were analyzed using SPSS version 29, with Chi-square and Fisher's exact tests, and a p-value <0.05 was considered statistically significant. The results showed that a female predominance (70.0%), the most affected age group was 26–35 years (40.0%). According to the Wilkes classification, Stage II was the most frequent (30.0%), followed by Stage III. This study concluded that temporomandibular joint dysfunction predominantly affects young to middle-aged females, with early to moderate stages being most common. Conservative management, including self-education, occlusal splints, and physiotherapy, is generally effective, leading to favorable treatment outcomes.

Keywords: Temporomandibular Joint Dysfunction, Wilkes Classification, Retrospective study, Treatment Outcomes.

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INTRODUCTION

Temporomandibular Dysfunction (TMD) comprises a group of musculoskeletal and neuromuscular disorders affecting the temporomandibular joint (TMJ), masticatory muscles, and associated structures. It is characterized by pain, joint sounds such as clicking or popping, restricted jaw movement, and occasionally headache or ear discomfort [1,2]. The etiology of TMD is multifactorial, including occlusal discrepancies, parafunctional habits (e.g., bruxism), trauma, psychological stress, systemic musculoskeletal conditions, and inflammatory or degenerative joint changes. The interaction of these factors can lead to both structural and functional impairment of the TMJ [3,4]. The Wilkes classification is widely recognized as a standardized system for staging TMD. It categorizes the disorder into five stages, from early/mild symptoms with minimal structural changes to advanced/terminal stages with chronic pain, joint degeneration, and functional limitation. This classification aids in diagnosis, prognosis, and treatment planning [5,6]. Management of TMD is typically stepwise, beginning with conservative approaches such as patient education, physiotherapy, jaw exercises, behavioral modification, occlusal splints, and pharmacologic therapy. Surgical interventions, including arthrocentesis, arthroscopy, or open joint surgery, are reserved for refractory or advanced cases [7,8].

Aim of Study

To evaluate the clinical characteristics, treatment modalities, and outcomes of patients with Temporomandibular Dysfunction (TMD) at the College of Dentistry, BAUC.

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LITERATURE REVIEW

Temporomandibular Dysfunction (TMD)

Temporomandibular dysfunction (TMD) comprises a group of multifactorial musculoskeletal and neuromuscular disorders affecting the temporomandibular joint (TMJ), masticatory muscles, and associated structures [9]. The condition presents with various clinical manifestations, including jaw pain, joint sounds such as clicking or popping, restricted mouth opening, headaches, and ear discomfort. Reported prevalence estimates range from 5% to 30%, depending on the diagnostic criteria and populations studied [10].

TMD is reported more frequently in females, particularly during the reproductive years. This observation has prompted investigations into the potential contributions of hormonal influences and psychosocial factors to disease development and progression. The condition may substantially affect quality of life through persistent pain, functional limitations, and difficulties with daily activities, including chewing, speaking, and yawning. Clinical presentations range from intermittent symptoms to chronic pain accompanied by persistent functional impairment [11]. TMD may also coexist with other conditions, including headaches, neck pain, and psychological distress, which can complicate clinical assessment and management [12].

The diagnosis of TMD requires a comprehensive assessment of patient-reported symptoms and clinical findings. Evaluation typically includes a detailed history, examination of the TMJ and masticatory muscles, assessment of mandibular range of motion, and observation of joint sounds during movement [13]. A systematic diagnostic approach is essential for identifying the predominant clinical features and guiding appropriate treatment.

Etiology and Risk Factors

The etiology of TMD is multifactorial, involving interactions among anatomical, physiological, psychological, and environmental factors. Structural abnormalities, including disc displacement and degenerative changes of the TMJ, may contribute to joint dysfunction and pain. Parafunctional activities, such as bruxism and sustained clenching, may increase mechanical loading of the masticatory system and contribute to symptom development or persistence [14].

Traumatic injuries, including direct trauma to the jaw and cervical acceleration-deceleration injuries, have also been associated with the onset of TMD. Psychological factors, particularly stress, anxiety, and depression, may influence pain perception, contribute to parafunctional behaviors, and increase the likelihood of persistent symptoms. Furthermore, systemic inflammatory and musculoskeletal conditions, including rheumatoid arthritis, may affect the TMJ and complicate disease management [15].

Hormonal influences have received particular attention in research investigating the higher prevalence of TMD among females. Proposed mechanisms include alterations in pain sensitivity and connective tissue characteristics; however, the relative contributions of these mechanisms require further clarification. Other potentially relevant factors include occupational posture, repetitive jaw movements, and previous dental or surgical interventions. Collectively, these findings support a biopsychosocial understanding of TMD, in which symptoms may arise from the interaction of multiple predisposing, initiating, and perpetuating factors rather than a single etiological mechanism [16].

Clinical Evaluation and Staging

Comprehensive clinical evaluation is essential for diagnosing TMD, determining disease severity, and selecting appropriate treatment. The assessment generally includes a detailed medical and dental history, evaluation of pain characteristics, examination of the TMJ and masticatory muscles, and measurement of mandibular movements. Imaging investigations, including panoramic radiography, computed tomography (CT), cone-beam computed tomography (CBCT), or magnetic resonance imaging (MRI), may be indicated when additional information regarding joint structures, osseous changes, or disc position is required [17].

Clinical assessment commonly addresses pain, joint sounds, restricted mandibular movement, and associated symptoms such as headaches and ear discomfort. Maximum interincisal opening, lateral excursions, and protrusive movements can provide objective measures of mandibular function. Palpation of the TMJ and masticatory muscles may help identify tenderness and muscular involvement.

The Wilkes classification is commonly used to describe the progression of internal derangement of the TMJ across five stages, ranging from early disease to advanced structural changes and functional impairment. Stage I generally represents early internal derangement with relatively mild symptoms, whereas Stage II is associated with more frequent symptoms and early structural changes. Stage III reflects intermediate disease with more pronounced clinical manifestations, while Stage IV is characterized by advanced structural alterations. Stage V represents advanced or terminal disease, which may include significant degenerative changes and functional impairment [18].

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Although the Wilkes classification provides a useful framework for describing the severity of TMJ internal derangement, it should not be considered a universal staging system for all TMD presentations. Clinical findings, symptom duration, functional limitations, and relevant imaging results should be interpreted together to support individualized treatment planning. Appropriate assessment and classification can assist clinicians in determining whether conservative management is sufficient or whether further intervention should be considered [19].

Treatment Modalities

The management of TMD generally follows a stepwise approach, with conservative and minimally invasive treatments considered before more invasive procedures. Initial management may include patient education, reassurance, modification of aggravating habits, reduction of excessive jaw loading, jaw exercises, and postural or ergonomic adjustments [20]. These measures aim to reduce symptom-provoking activities and improve mandibular function.

Occlusal splints may be considered for selected patients, particularly when bruxism or other parafunctional activities are relevant. Physiotherapy, including manual techniques, stretching, and therapeutic exercises, may help improve mobility and reduce pain. Pharmacological management may involve analgesics and non-steroidal anti-inflammatory drugs (NSAIDs), depending on the clinical presentation, contraindications, and individual patient needs. Muscle relaxants may be considered in selected circumstances following appropriate clinical assessment.

Psychological and behavioral interventions may also be beneficial, particularly for patients experiencing persistent pain, stress, or other psychosocial difficulties. Treatment selection should account for the predominant diagnosis, symptom severity, duration, functional impairment, and patient preferences. For patients who do not respond adequately to conservative treatment, minimally invasive procedures, such as arthrocentesis or arthroscopy, may be considered when clinically indicated. Open joint surgery is generally reserved for selected cases involving substantial structural pathology or persistent symptoms despite appropriate less-invasive management [21].

The literature supports a conservative-first approach for many patients with TMD, although treatment effectiveness varies according to the underlying disorder and individual clinical characteristics. Invasive interventions should therefore be selected according to specific indications rather than disease severity alone. An interdisciplinary approach involving dental professionals, medical practitioners, physiotherapists, and mental health professionals may further support individualized care and improve the management of complex or persistent cases [22–25].

MATERIALS AND METHODS

This research is a retrospective observational study conducted on patients diagnosed with Temporomandibular Dysfunction (TMD) at the College of Dentistry, BAUC. Ethical approval was obtained from the College of Dentistry Research Committee. The study included patients who received treatment between 1st January 2024 and 1st July 2024. The study was conducted in Diyala Governorate, Iraq.

Inclusion Criteria

- Patients clinically diagnosed with temporomandibular disorder (TMD) involving internal derangement, fulfilling the criteria of the Wilkes classification based on clinical examination.
- Age between 18 and 50 years.
- Both genders.
- Patients who completed the prescribed treatment protocol and follow-up.

Exclusion Criteria

- History of craniofacial trauma or surgery affecting the temporomandibular joint.
- Systemic musculoskeletal disorders (e.g., rheumatoid arthritis).
- Neurological disorders affecting facial muscles.
- Patients with incomplete medical records or follow-up.

A total of 60 patients were included in the study. All patients underwent a standardized assessment that included demographic data, clinical symptoms (jaw pain, clicking, restricted mouth opening, headache, and ear pain), and staging of temporomandibular disorders (TMD) according to the Wilkes classification.

Pain Assessment and Classification of Treatment Outcomes

Pain intensity was assessed using the Visual Analogue Scale (VAS), ranging from 0 to 10 cm, where 0 indicated no pain and 10 indicated the worst possible pain. VAS scores were recorded at baseline, during treatment sessions, and at the end of the follow-up period, according to the data available in the retrospective records. Pain reduction was categorized as follows:

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- Complete Improvement: VAS score of 0–1 cm.
- Partial Improvement: VAS score of 2–4 cm.
- No Improvement: VAS score of ≥5 cm or no meaningful reduction in pain intensity.

Overall treatment outcomes were classified into three categories based on symptom resolution, functional recovery, and pain reduction:

- Complete Improvement: Resolution of the primary symptoms, including jaw pain, clicking, restricted mouth opening, headache, and ear pain, accompanied by restoration of jaw function.
- Partial Improvement: Reduction in symptom severity or frequency, with residual pain or functional limitation.
- No Improvement: Minimal or no improvement in symptoms or jaw function following treatment.

All patients received treatment according to standard clinical protocols. The treatment and follow-up periods ranged from 4 to 12 weeks, depending on disease stage and clinical response. Treatment outcomes were retrospectively classified as complete improvement, partial improvement, or no improvement based on the documented clinical findings and VAS scores.

Statistical Analysis

Data were compiled using Microsoft Excel 2013 and analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized as counts and percentages. Comparisons and associations between Wilkes classification stages, clinical symptoms, treatment modalities, and treatment outcomes (including Visual Analogue Scale pain scores) were evaluated using the chi-square test or Fisher's exact test, as appropriate. Statistical significance was established at $p < 0.05$.

RESULTS

The demographic characteristics of patients diagnosed with temporomandibular joint disorders (TMD) are summarized in Table1. The study cohort demonstrated a clear female predominance, with females comprising 70.0% (n = 42) of the population and males accounting for 30.0% (n = 18). Across age categories, the highest concentration of patients was in the 26–35 age group (40.0%), followed by those aged 18–25 years (25.0%), 36–45 years (20.0%), and >45 years (15.0%).

Table 1. Demographic Characteristics of Patients with Temporomandibular Dysfunction (TMD)

Variable	Category	Frequency	Percent (%)
Gender	Male	18	30.0
	Female	42	70.0
Age Group (Years)	18–25	15	25.0
	26–35	24	40.0
	36–45	12	20.0
	>45	9	15.0

Stage II represented the most prevalent condition, comprising 30.0% of cases, followed by Stage III (25.0%) and Stage I (20.0%). Advanced disease was less common, with Stage IV and Stage V accounting for 15.0% and 10.0% of patients, respectively. Regarding clinical presentation, jaw pain was the predominant symptom (41.7%), followed by joint clicking or popping (25.0%) and restricted mouth opening (20.0%). Headache or ear pain was the least frequently reported symptom, affecting 13.3% of the study cohort (Table 2). Figure 1shows the distribution of clinical symptoms among the study population.

Table 2. Distribution of TMD Stages and Clinical Symptoms Among the Study Population

		Frequency	Percent (%)
TMD Stage (Wilkes Classification)	Stage I	12	20.0
	Stage II	18	30.0
	Stage III	15	25.0
	Stage IV	9	15.0
	Stage V	6	10.0
Clinical Symptoms	Jaw pain	25	41.7
	Clicking / Popping	15	25.0
	Limited mouth opening	12	20.0
	Headache / Ear pain	8	13.3
Total		60	100

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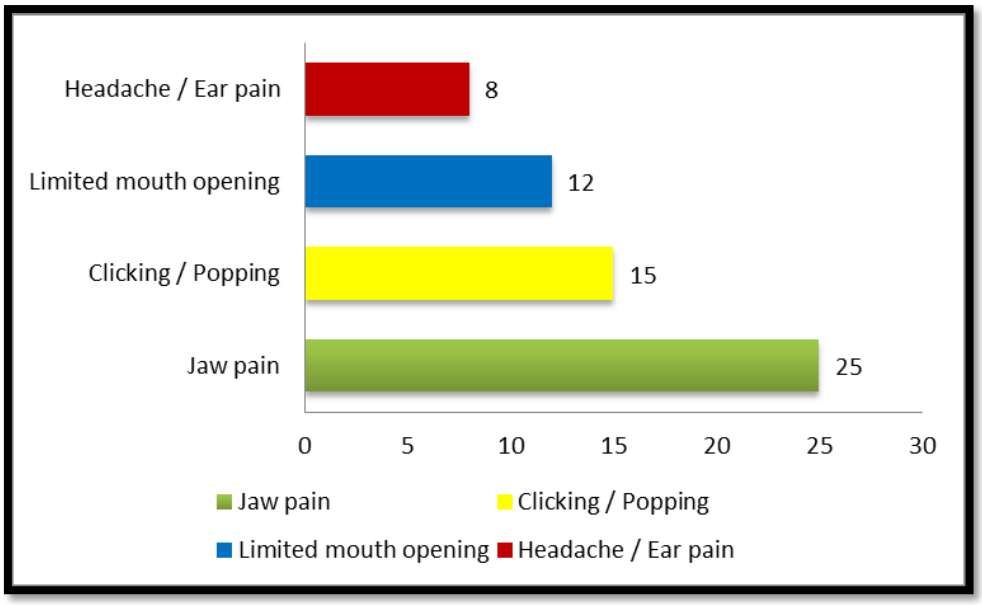


Figure 1. Distribution of Clinical Symptoms Among the Study Population

Self-education was the most frequently employed treatment approach, accounting for 33.3% of cases, followed by occlusal splints (25.0%) and physiotherapy (16.7%). Pharmacological management was used in 13.3% of patients, while prosthetic rehabilitation (8.3%) and surgical intervention (3.4%) were less commonly indicated, reflecting a preference for conservative management strategies. In terms of treatment outcomes, most patients achieved complete improvement (60.0%), whereas partial improvement was observed in 30.0% of cases. Only a small proportion of patients (10.0%) showed no improvement following treatment, as shown in table 3.

Table 3. Distribution of Treatment Modalities and Outcomes Among TMD Patients

	Treatment	Frequency	Percent (%)
Treatment Modalities	Self-education	20	33.3
	Occlusal splints	15	25.0
	Physiotherapy	10	16.7
	Medication	8	13.3
	Prosthetic rehabilitation	5	8.3
	Surgery	2	3.4
Treatment Outcomes	Complete improvement	36	60.0
	Partial improvement	18	30.0
	No improvement	6	10.0
Total		60	100

Jaw pain predominated in the early disease stages, occurring most frequently in Stage I (66.7%) and Stage II (50.0%), with a progressive decline in prevalence as disease severity advanced. Conversely, mechanical and functional impairments became more pronounced in advanced stages; specifically, limited mouth opening and headache or ear pain each reached a prevalence of 33.3% in Stages IV and V. Joint clicking demonstrated a balanced distribution across intermediate stages, peaking during Stages II and III. Statistical analysis demonstrated a significant association between Wilkes stage and clinical presentation (p = 0.038), indicating that symptom profiles evolve significantly with disease progression (Table 4.).

Table 4. Association Between Wilkes Classification Stages and Clinical Symptoms in TMD Patients

Wilkes Stage	Jaw pain n (%)	Clicking n (%)	Limited opening n (%)	Headache / Ear pain n (%)	P value
Stage I	8 (66.7%)	2 (16.7%)	1 (8.3%)	1 (8.3%)	0.038
Stage II	9 (50.0%)	5 (27.8%)	3 (16.7%)	1 (5.5%)	
Stage III	5 (33.3%)	5 (33.3%)	3 (20.0%)	2 (13.3%)	
Stage IV	2 (22.2%)	2 (22.2%)	3 (33.3%)	2 (22.2%)	
Stage V	1 (16.7%)	1 (16.7%)	2 (33.3%)	2 (33.3%)	

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Higher rates of complete improvement were observed in early stages, with Stage I and Stage II demonstrating complete improvement rates of 66.7% and 61.1%, respectively, while a gradual decline in complete recovery was noted with advancing stages. Conversely, partial or absent improvement became more frequent in advanced stages, reflecting reduced treatment responsiveness in severe disease. Regarding clinical symptoms, patients presenting with jaw pain showed the highest rate of complete improvement (64.0%), followed by clicking (60.0%) and limited mouth opening (58.3%), whereas headache or ear pain was associated with the lowest complete improvement rate (50.0%) and the highest proportion of no improvement. Statistical analysis revealed a significant association between Wilkes stage and treatment outcome (P = 0.016), as well as between clinical symptoms and treatment outcome (P = 0.042), indicating that both disease stage and symptom profile significantly influence therapeutic response, as shown in table 5.

Table 5. Association of Wilkes Stage and Clinical Symptoms with Treatment Outcomes in TMD Patients

Variable	Category	Complete n (%)	Partial n (%)	No improvement n (%)	P value
Wilkes Stage	Stage I	8 (66.7%)	3 (25.0%)	1 (8.3%)	0.016
	Stage II	11 (61.1%)	5 (27.8%)	2 (11.1%)	
	Stage III	9 (60.0%)	4 (26.7%)	2 (13.3%)	
	Stage IV	5 (55.6%)	2 (22.2%)	2 (22.2%)	
	Stage V	3 (50.0%)	4 (66.7%)	0 (0.0%)	
Clinical Symptoms	Jaw pain	16 (64.0%)	6 (24.0%)	3 (12.0%)	0.042
	Clicking	9 (60.0%)	4 (26.7%)	2 (13.3%)	
	Limited opening	7 (58.3%)	3 (25.0%)	2 (16.7%)	
	Headache / Ear pain	4 (50.0%)	2 (25.0%)	2 (25.0%)	

DISCUSSION

The observed female predominance in this retrospective study aligns with established literature and reflects multifactorial influences, including hormonal modulation, heightened pain sensitivity, and sociobehavioral patterns. Estrogen and progesterone fluctuations alter temporomandibular joint (TMJ) connective tissue elasticity and pain processing, predisposing women to a higher incidence of temporomandibular disorders (TMD) (Gauer & Semidey, 2015) [26]. Furthermore, the concentration of cases in young to middle adulthood corresponds with findings by Zieliński *et al*. (2023) [27], who reported that TMD prevalence peaks during working-age years. This peak is largely driven by increased masticatory muscle load and elevated exposure to stressors that trigger or exacerbate parafunctional habits, such as clenching and bruxism. Discrepancies between these findings and broader population-based studies—where age distributions are often wider or peak later—may stem from differences in healthcare access, referral pathways, and care-seeking behaviors. Overall, this demographic profile provides crucial context for evaluating disease stage distribution, symptom severity, and treatment response, highlighting the interplay between biological susceptibility and behavioral dynamics in TMD pathogenesis.

The predominance of Stage II involvement, characterized primarily by jaw pain, underscores that patients most frequently seek clinical evaluation at moderate stages of disease severity. Physiologically, jaw pain reflects nociceptive activation within temporomandibular joint (TMJ) structures and associated masticatory musculature, whereas joint clicking and restricted mouth opening signify mechanical derangements that worsen alongside progressive joint degeneration and muscular imbalance. These findings align with those of Calixtre *et al*. (2019) [28], who observed comparable early-to-mid-stage symptom profiles and noted that mechanical functional impairment typically succeeds the onset of pain. In contrast, Kaczmarek *et al*. (2025) [29] reported a more homogeneous symptom distribution across clinical stages, a discrepancy potentially attributable to variations in cohort selection, diagnostic criteria, or clinical assessment sensitivity. Taken together, these observations suggest a natural disease trajectory transitioning from isolated nociceptive pain to combined nociceptive and biomechanical dysfunction. Identifying such stage-specific symptom profiles is essential for guiding targeted therapeutic strategies and predicting treatment response.

The preference for conservative management strategies, particularly self-education, occlusal splints, and physiotherapy, reflects adherence to evidence-based guidelines advocating minimal invasiveness in early- and moderate-stage TMD, as reported by Wadhokar and Patil (2022) [30] and Kalladka *et al*. (2021) [31]. Self-education may modify parafunctional behaviors, while occlusal splints redistribute occlusal forces, reduce joint load, and decrease muscular hyperactivity. High rates of complete improvement indicate the effectiveness of early-stage interventions, whereas the low frequency of surgical procedures contrasts with Garstka *et al*. (2023) [32], who reported surgery in refractory or structurally advanced cases. The alignment of these findings with conservative treatment literature suggests that patient education, behavioral modification, and non-invasive interventions remain central to optimizing outcomes, and underscores the role of early diagnosis in improving prognosis. Differences in treatment utilization may arise from accessibility, clinician preference, or patient adherence.

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Symptom patterns demonstrate a clear progression: jaw pain dominates early stages, while mechanical and functional manifestations, including limited mouth opening and headache/ear pain, become more prevalent in advanced stages. This stage-dependent distribution aligns with Zieliński *et al*. (2023) [33], supporting the concept that TMJ structural degeneration, muscular adaptation, and central sensitization intensify symptom severity with disease progression. Alkhudhairy *et al*. (2018) [34] reported more uniform headache distribution, suggesting that individual factors, such as stress, comorbidities, or genetic predisposition, may modulate symptom expression. The data emphasize that clinical presentation is not static; rather, it reflects dynamic pathophysiological changes, which must be considered when developing stage-specific therapeutic strategies. Understanding these patterns allows clinicians to anticipate functional limitations and implement preventive or corrective interventions before irreversible joint changes occur.

Treatment outcomes show that early-stage disease and jaw pain-predominant presentations are associated with higher rates of complete improvement, reflecting the responsiveness of less structurally compromised joints and less chronic muscular adaptation, in alignment with Armijo-Olivo *et al*. (2016) [35]. Conversely, advanced stages and symptoms like headache or ear pain exhibit reduced treatment responsiveness, consistent with Gil-Martínez *et al*. (2018) [36], likely due to established structural changes, chronic myofascial adaptations, and central pain sensitization. Integrating stage, symptom profile, and treatment modality illustrates that early identification and conservative intervention maximize therapeutic benefit, whereas delayed diagnosis or advanced disease necessitates multimodal or more intensive interventions. This highlights the importance of individualized treatment planning that considers both the disease stage and clinical presentation to optimize functional recovery and achieve effective pain control.

CONCLUSION

The study found that TMD predominantly affected females and young to middle-aged adults, with Wilkes stages I–III and jaw pain being the most common presentations. Conservative treatments, including patient education, occlusal splints, and physiotherapy, generally produced favorable outcomes. However, advanced disease stages and associated headache or ear pain was linked to lower rates of complete improvement, emphasizing the importance of individualized treatment based on disease severity and clinical symptoms.

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