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COMPARATIVE EFFECTIVENESS OF MOBILIZATION AND OCCLUSAL SPLINTS ON PAIN, FUNCTIONAL ABILITY AND QUALITY OF LIFE IN TEMPOROMANDIBULAR DISORDER MANAGEMENT

Original Research (ID: 1684)

Ishrat Bibi[1]*, Dr. Muhammad Naveed Babur[2]
[1]DPT-MS Orthopedic Physical Therapist, Superior University Lahore Pakistan
[2]Dean Faculty of Allied Health Sciences Superior University Lahore Pakistan
Corresponding Author: Ishrat Bibi, dr.ishratwali@gmail.com, DPT-MS Orthopedic Physical Therapist, Superior University Lahore Pakistan
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ABSTRACT

Background: Temporomandibular disorders are common causes of non-dental orofacial pain and may disturb chewing, speaking, jaw mobility, sleep, and oral health-related quality of life. Conservative treatments are usually preferred because they are reversible and safer than invasive approaches. Manual therapy and occlusal splints are frequently used in clinical practice, but their relative effectiveness remains less clearly established, particularly in short-term management of pain and quality-of-life outcomes among patients with temporomandibular disorders.

Objective: To compare the effectiveness of mobilization-based manual therapy and occlusal splint therapy on pain intensity and oral health-related quality of life in patients with temporomandibular disorders.

Methods: This randomized controlled trial was conducted on 24 participants clinically diagnosed with temporomandibular disorders. Participants were randomly allocated into two equal groups. Group A received mobilization-based manual therapy, including temporomandibular joint mobilization, soft tissue techniques, cervical mobilization, and jaw exercises. Group B received individually fabricated occlusal stabilization splints, mainly used at night, over a six-week intervention period. Pain intensity was assessed using the Visual Analog Scale, while oral health-related quality of life was measured using the Oral Health Impact Profile before and after treatment. Data were analyzed using SPSS version 25. The Shapiro–Wilk test assessed normality, while Wilcoxon signed-rank and Mann–Whitney U tests were applied for within-group and between-group comparisons.

Results: The mean age of participants was 38.08 ± 14.01 years, with 14 males and 10 females. In Group A, Visual Analog Scale scores decreased from 6.69 ± 0.85 to 2.07 ± 0.86 ($p = 0.001$), while Oral Health Impact Profile scores decreased from 35.23 ± 6.57 to 14.84 ± 2.64 ($p = 0.001$). In Group B, Visual Analog Scale scores decreased from 6.67 ± 0.88 to 3.75 ± 0.75 ($p = 0.002$), and Oral Health Impact Profile scores decreased from 31.83 ± 2.58 to 20.75 ± 1.86 ($p = 0.002$). Post-treatment between-group analysis showed significant differences favoring manual therapy for both outcomes ($p = 0.001$).

Conclusion: Both interventions were effective in managing temporomandibular disorders; however, mobilization-based manual therapy produced greater short-term improvement in pain and oral health-related quality of life.

Keywords: Facial Pain; Musculoskeletal Manipulations; Occlusal Splints; Pain Measurement; Physical Therapy Modalities; Quality of Life; Temporomandibular Joint Disorders.

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INTRODUCTION

Temporomandibular disorders (TMDs) represent a broad group of musculoskeletal and neuromuscular conditions involving the temporomandibular joint (TMJ), masticatory muscles, and associated craniofacial structures. These disorders commonly present with jaw pain, joint clicking or crepitus, restricted mandibular movement, muscle tenderness, headache, ear-related discomfort, and difficulty during routine oral functions such as chewing, speaking, yawning, and prolonged jaw activity. Although TMDs are not usually life-threatening, their persistent symptoms can interfere with eating habits, sleep quality, communication, emotional well-being, social participation, and overall quality of life (1). Due to this wide functional and psychosocial burden, TMD has become an important clinical concern in dentistry, physiotherapy, rehabilitation, and pain management. TMD is considered one of the most common non-dental causes of orofacial pain, affecting approximately 5–12% of the global population. It is reported more frequently among females and young adults, suggesting that biological, hormonal, psychological, and behavioral factors may contribute to its development and persistence (2). The higher prevalence among females has been linked with possible hormonal influences on joint laxity, pain sensitivity, connective tissue behavior, and central pain processing mechanisms (3). However, TMD cannot be explained by a single factor alone. Its development is usually multifactorial, involving biomechanical disturbances, parafunctional habits, malocclusion, bruxism, trauma, emotional stress, poor posture, muscular imbalance, and altered neuromuscular control (4).

Current understanding of TMD increasingly supports a biopsychosocial model, where structural, functional, emotional, and behavioral factors interact with one another. Psychological stress, anxiety, disturbed sleep, and emotional strain may increase masticatory muscle activity, aggravate parafunctional habits, and alter pain modulation pathways (5). In patients with persistent symptoms, repeated nociceptive input may contribute to central sensitization, where pain becomes amplified and continues even when the original tissue irritation is no longer prominent (6). This explains why some patients experience prolonged pain, widespread tenderness, or increased sensitivity despite limited visible joint pathology. Therefore, effective management of TMD should address not only local joint or muscle dysfunction but also functional limitation, pain behavior, and quality-of-life impairment. The clinical presentation of TMD varies considerably among patients. Some individuals mainly report pain around the TMJ or masticatory muscles, while others experience clicking, locking, limited mouth opening, deviation during jaw movement, headache, or ear symptoms (7). Functional limitations may become particularly distressing when pain affects basic activities such as eating, speaking, laughing, or yawning. In more severe or chronic cases, mandibular dysfunction can influence nutrition, sleep, mood, work efficiency, and social confidence (8). For this reason, pain intensity alone is not sufficient to judge treatment success. Improvement in jaw function, daily activity performance, and oral health-related quality of life should also be considered essential outcomes in TMD management.

Conservative and reversible treatment approaches are generally recommended as the first line of management for TMD because they are safer, less invasive, cost-effective, and associated with fewer complications than surgical or irreversible dental procedures (9). Common conservative options include patient education, behavioral modification, pharmacological therapy, home exercises, posture correction, manual therapy, soft tissue techniques, relaxation strategies, and occlusal splint therapy. Among these, physiotherapy-based interventions have gained increasing clinical attention because they target musculoskeletal impairments such as joint hypomobility, muscle tightness, poor cervical posture, altered movement control, and pain-related functional restriction (10). Mobilization therapy is one of the commonly used manual therapy approaches in TMD rehabilitation. It involves passive, low-velocity, controlled gliding movements applied to the TMJ and related soft tissues with the purpose of improving joint mobility, reducing stiffness, decreasing pain, and restoring normal mandibular mechanics (11). Its therapeutic effects are believed to occur through both mechanical and neurophysiological mechanisms. Mechanically, mobilization may improve joint play, enhance synovial fluid distribution, reduce capsular restriction, and promote more coordinated mandibular movement. Neurophysiologically, it may stimulate mechanoreceptors, reduce nociceptive input, modulate pain pathways, and promote muscle relaxation (12). Previous studies have reported improvements in pain intensity, jaw range of motion, and functional outcomes following manual therapy and mobilization-based interventions in patients with TMD (13).

Occlusal splint therapy is another widely used conservative treatment for TMD. Occlusal splints are removable intraoral appliances designed to stabilize occlusion, reduce excessive loading on the TMJ, minimize parafunctional activities such as bruxism, and decrease abnormal strain on masticatory muscles (14). These appliances are frequently prescribed in clinical practice because they are reversible and relatively simple to use. Evidence suggests that occlusal splints may help reduce pain and improve oral function in selected patients; however, findings across studies remain variable, and there is still uncertainty regarding their comparative effectiveness against physiotherapy-based manual techniques such as mobilization (15). Despite the common use of both mobilization and occlusal splints, a clinically relevant gap remains regarding which intervention produces better outcomes in terms of pain reduction, functional ability, and quality of life. Many available studies focus on either manual therapy or splint therapy separately, while direct comparison between these two conservative approaches remains limited. This makes treatment selection difficult for clinicians, especially when managing patients who require practical, non-invasive, and function-oriented care. The central research question of this study was whether

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INSIGHTS-JHR
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mobilization therapy is more effective than occlusal splint therapy, or whether both interventions provide comparable benefits, in improving pain, functional ability, and quality of life among patients with temporomandibular disorders.

Therefore, this study was designed to compare the effectiveness of mobilization and occlusal splint therapy in the management of temporomandibular disorders. The objective was to determine their relative effects on pain intensity, functional ability, and quality of life, with the rationale that identifying the more effective conservative intervention may help guide evidence-based clinical decision-making, improve patient-centered outcomes, and support safer, non-invasive rehabilitation strategies for individuals with TMD.

METHODS

This randomized controlled trial was conducted to compare the effectiveness of mobilization therapy and occlusal splint therapy in the management of temporomandibular disorders. The study was carried out at Rahim Yar Khan Hospital over a period of four months after obtaining approval from the Institutional Review Board/Ethical Committee of Superior University Lahore prior to data collection. The study was conducted in accordance with ethical principles for human research. All eligible participants were informed about the purpose, procedure, possible benefits, and voluntary nature of the study before enrollment. Written informed consent was obtained from each participant, and confidentiality of all collected data was maintained throughout the research process. A total of 24 clinically diagnosed patients with temporomandibular disorders were recruited through a non-probability convenience sampling technique. Both male and female participants aged 18 to 65 years were considered eligible for inclusion. Participants were included if they had a clinical diagnosis of temporomandibular disorder and reported moderate to severe pain, defined as a score greater than 4 on the Visual Analog Scale. Patients were excluded if they had a history of temporomandibular joint surgery, severe malocclusion requiring orthodontic correction, systemic musculoskeletal or inflammatory disorders that could influence jaw function, or pregnancy. These criteria were applied to ensure that the outcomes were primarily related to the selected interventions rather than other medical or structural conditions.

After baseline assessment, the participants were randomly allocated into two equal groups, with 12 participants in each group. Randomization was performed using a computer-generated random allocation sequence, and allocation concealment was maintained through sealed envelopes. The study was conducted as a single-blinded trial, in which the outcome assessor remained unaware of the participants' group allocation. Baseline demographic and clinical information was collected before starting the intervention, and outcome measures were recorded before and after the six-week treatment period. Participants in Group A received mobilization-based manual therapy directed toward the temporomandibular joint and surrounding soft tissues. The intervention included passive low-velocity joint mobilization, TMJ distraction, gliding techniques, cervical mobilization, soft tissue mobilization, and jaw mobility exercises. Treatment sessions were provided twice weekly for six weeks, with each session lasting approximately 30 to 45 minutes. In addition to supervised treatment, participants were advised to perform prescribed home exercises once or twice daily for 5 to 10 minutes to maintain treatment effects, improve mandibular mobility, and support functional recovery.

Participants in Group B received occlusal splint therapy. Individually fabricated stabilization splints were provided according to each participant's dental arch alignment and comfort. The splints were mainly used at night for approximately 8 to 10 hours daily over the six-week intervention period. Regular assessment and adjustment of the splints were performed when required to ensure appropriate fit, comfort, and clinical usability. The purpose of the splint therapy was to reduce excessive loading on the temporomandibular joint, limit parafunctional activity such as bruxism, decrease strain on the masticatory muscles, and support improvement in pain and oral function. Pain intensity and oral health-related quality of life were assessed at baseline and after completion of the intervention period. Pain was measured using the Visual Analog Scale, which is a widely used and reliable instrument for subjective pain assessment. Oral health-related quality of life was evaluated using the Oral Health Impact Profile, which assesses the functional, psychological, and social impact of oral health problems on daily life. These measures were selected to determine whether the interventions produced clinically meaningful changes in pain and quality of life among patients with temporomandibular disorders.

Data were analyzed using the Statistical Package for Social Sciences version 25. Demographic characteristics were summarized using descriptive statistics, including frequency, percentage, mean, and standard deviation where appropriate. The Shapiro–Wilk test was applied to assess the normality of the data. As the data did not follow a normal distribution, non-parametric statistical tests were used. The Wilcoxon signed-rank test was applied for within-group comparison of pre- and post-intervention scores, while the Mann–Whitney U test was used to compare outcomes between the mobilization and occlusal splint groups. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

A total of 24 participants diagnosed with temporomandibular disorders completed the study. The participants were equally distributed into two groups, with 12 participants in the mobilization/manual therapy group and 12 participants in the occlusal splint therapy group.

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The mean age of the participants was 38.08 ± 14.01 years. Of the total sample, 14 participants were male, representing 58.3%, while 10 participants were female, representing 41.7%. The Shapiro–Wilk test showed that the outcome data were not normally distributed; therefore, non-parametric statistical tests were applied. Baseline comparison between the two groups showed no statistically significant difference in pain intensity measured by the Visual Analog Scale, with both groups having the same mean rank of 12.50 and a non-significant p-value of 0.875. Similarly, baseline Oral Health Impact Profile scores were not significantly different between the mobilization group and the occlusal splint group, with mean ranks of 14.17 and 10.83, respectively, and a p-value of 0.247.

Within-group analysis showed a statistically significant reduction in pain intensity after treatment in both groups. In the mobilization group, the mean Visual Analog Scale score decreased from 6.69 ± 0.85 before treatment to 2.07 ± 0.86 after treatment, with a statistically significant difference reported on the Wilcoxon signed-rank test (Z = -3.185, p = 0.001). In the occlusal splint therapy group, the mean Visual Analog Scale score decreased from 6.67 ± 0.88 before treatment to 3.75 ± 0.75 after treatment, which was also statistically significant (Z = -3.134, p = 0.002). Oral health-related quality of life also improved significantly within both groups after the intervention period. In the mobilization group, the mean Oral Health Impact Profile score decreased from 35.23 ± 6.57 at baseline to 14.84 ± 2.64 after treatment, showing a statistically significant improvement (Z = -3.208, p = 0.001). In the occlusal splint therapy group, the mean Oral Health Impact Profile score decreased from 31.83 ± 2.58 before treatment to 20.75 ± 1.86 after treatment, with a statistically significant difference (Z = -3.084, p = 0.002).

Post-treatment between-group comparison showed statistically significant differences in favor of the mobilization group for both measured outcomes. For post-treatment Visual Analog Scale scores, the mobilization group had a lower mean rank of 6.92 compared with 18.08 in the occlusal splint therapy group, with a statistically significant difference (Z = -3.989, p = 0.001). For post-treatment Oral Health Impact Profile scores, the mobilization group also showed a lower mean rank of 6.58 compared with 18.52 in the occlusal splint therapy group, and the difference was statistically significant (Z = -4.122, p < 0.001). Overall, both groups showed significant improvement from baseline to post-treatment assessment, while greater numerical improvement was observed in the mobilization group for pain intensity and oral health-related quality of life.

Table 1: Demographics statistics

Variable	**Category**	**Frequency (n)**	**Percentage (%)**
Age (years)	Mean ± SD	38.08 ± 14.01	
Gender	Male	14	58.3
	Female	10	41.7
Study Groups	Group A (Manual Therapy)	12	50.0
	Group B (Occlusal Splint Therapy)	12	50.0

Table 2: Mann Whitney U between groups analysis of visual analogue scale and oral health impact profile

Visual Analogue scale	Groups	Mean rank	median Q1-Q3	z-value	P value
Pre-test	Group A	12.50	6.00	.000	.875
	Group B	12.50			
Post-test	Group A	6.92	2.00	-3.989	.001
	Group B	18.08			
Oral Health Impact Profile	Groups	Mean rank	median Q1-Q3	z-value	P value
Pre-test	Group A	14.17	30.00	-1.159	.247
	Group B	10.83			
Post-test	Group A	6.58	14.00	-4.122	.000
	Group B	18.52			

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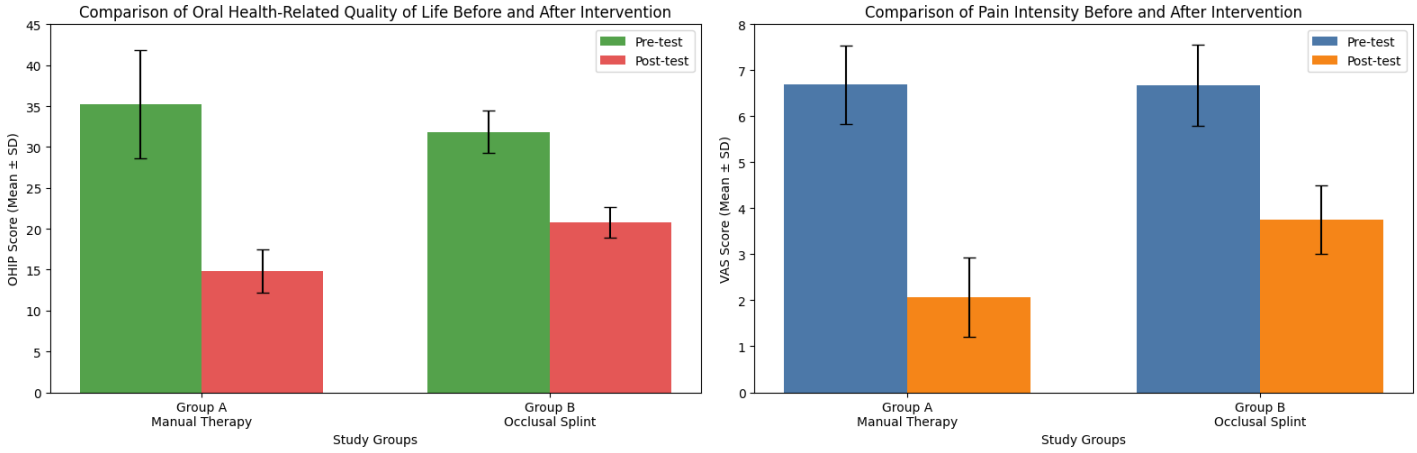
Table 3: Wilcoxon sign rank test within Group A analysis of visual analogue scale and oral health impact profile

Variables		Mean± SD	Z score	P value
Visual Analogue scale	Pre test	6.69±.85		
	Post test	2.07± .86	-3.185	.001
Oral Health Impact Profile	Pre test	35.23± 6.57		
	Post test	14.84± 2.64	-3.208	.001

Table 4 Wilcoxon sign rank test within Group B analysis of visual analogue scale and oral health impact profile

Variables		Mean± SD	Z score	P value
Visual Analogue scale	Pre test	6.67±.88		
	Post test	3.75± .75	-3.134	.002
Oral Health Impact Profile	Pre test	31.83± 2.58		
	Post test	20.75±1.86	-3.084	.002



DISCUSSION

This study evaluated the comparative effectiveness of mobilization therapy and occlusal splint therapy in reducing pain intensity and improving oral health-related quality of life among patients with temporomandibular disorders. The findings showed that both interventions produced statistically significant improvements after six weeks of treatment; however, greater improvement was observed in the mobilization group. Pain intensity decreased more prominently in participants who received mobilization therapy, and oral health-related quality of life also improved to a greater extent in this group compared with participants treated with occlusal splints. These findings supported the clinical value of conservative management in TMD and suggested that physiotherapy-based manual therapy may provide stronger short-term benefits for pain and functional well-being. The reduction in pain intensity after mobilization therapy was an important finding of the present study. Participants in the mobilization group showed a marked decrease in Visual Analog Scale scores after the intervention period, indicating that manual therapy may be effective in relieving TMD-related pain. This improvement may be explained by the mechanical and neurophysiological effects of mobilization, including reduction of joint stiffness, improvement in mandibular movement, relaxation of masticatory muscles, stimulation of mechanoreceptors, and modulation of nociceptive input. A previous study reported that mobilization techniques improved jaw mobility and reduced pain in patients with TMD by restoring normal jaw mechanics and decreasing muscular tension (16). Similar findings were reported in another study, where manual therapy applied to the temporomandibular and cervical regions reduced pain and improved jaw function through mechanoreceptor stimulation and pain pathway modulation (17). The present findings were consistent with these reports and further supported the role of manual therapy in reducing TMD-related pain.

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Improvement in oral health-related quality of life was also more pronounced in the mobilization group. The decrease in Oral Health Impact Profile scores suggested that participants experienced less functional, psychological, and social burden after receiving mobilization therapy. This finding was clinically meaningful because TMD affects not only pain perception but also eating, speaking, yawning, sleep quality, emotional comfort, and social participation. A systematic review comparing manual therapy and occlusal splint therapy reported that manual therapy produced better short-term improvements in pain and mandibular function (18). The present study showed a similar pattern, as mobilization appeared to provide broader benefits by addressing joint mobility, muscular restriction, and pain-related functional limitation together. The findings were also in agreement with previous evidence comparing exercise-based physiotherapy approaches with occlusal splint therapy in painful TMD. A systematic review reported that physiotherapy interventions were more effective than splint therapy in short-term pain reduction and jaw function improvement (19). This may be because mobilization and related therapeutic exercises directly target neuromuscular control, soft tissue flexibility, joint mechanics, and movement confidence. In contrast, splint therapy mainly reduces abnormal occlusal loading and parafunctional activity. Although both approaches are conservative and clinically useful, mobilization may provide a more active and comprehensive rehabilitation effect in patients where joint stiffness, muscle guarding, and movement restriction contribute to symptoms.

Occlusal splint therapy also produced statistically significant improvement in pain intensity and oral health-related quality of life. Participants treated with splints showed reduced Visual Analog Scale scores and improved Oral Health Impact Profile scores after six weeks of treatment. This finding supported the continued use of occlusal splints as a conservative option in TMD management, particularly in patients with bruxism, nocturnal clenching, or excessive masticatory muscle activity. A systematic review reported that occlusal splints were effective in reducing orofacial muscle pain and bruxism-related symptoms by redistributing occlusal forces and reducing excessive loading on the temporomandibular joint and masticatory muscles (20). Another study also reported that splint therapy improved pain and quality of life in TMD patients, especially where muscular hyperactivity and parafunctional habits were present (21). The present study supported these findings, although the magnitude of improvement was smaller than that observed with mobilization therapy. The stronger response observed in the mobilization group may have been related to the direct therapeutic effect of manual techniques on both joint and muscle components of TMD. Rhythmic joint mobilization has been reported to increase mouth opening and reduce pain intensity in patients with temporomandibular dysfunction (22). Mobilization may improve synovial fluid movement, reduce capsular restriction, enhance tissue extensibility, decrease protective muscle spasm, and restore smoother mandibular movement. These mechanisms may explain why participants receiving mobilization demonstrated greater reductions in pain and better quality-of-life outcomes. The results were also supported by evidence showing that physical therapy combined with or compared against splint-based care may produce superior improvements in pain and jaw function among patients with myogenous TMD (23).

The findings also had relevance within the biopsychosocial understanding of TMD. Pain in TMD is influenced not only by local joint or muscle pathology but also by psychological stress, emotional distress, sleep disturbance, behavioral patterns, and altered pain processing. Previous literature has shown that stress and anxiety may increase masticatory muscle tension and intensify pain perception in TMD patients (24). Mobilization therapy may indirectly influence these factors by reducing fear of jaw movement, improving patient confidence, decreasing muscle guarding, and allowing better participation in daily activities. Therefore, the improvement observed in the mobilization group was likely not limited to mechanical correction alone but may also have involved functional reassurance and reduction of pain-related distress. The present findings were consistent with current clinical recommendations that support conservative, reversible, and non-invasive approaches as first-line management strategies for TMD-related pain. Clinical practice guidelines have emphasized the role of manual therapy, therapeutic exercise, education, and other physiotherapy-based strategies in improving pain and functional outcomes while avoiding unnecessary invasive procedures (25). The present study added further support to this position by showing measurable improvement in both groups, with greater benefit in the mobilization group. Clinically, these results suggested that mobilization therapy may be considered an effective short-term conservative intervention for patients with TMD, particularly when pain, joint restriction, and functional limitations are prominent.

One strength of this study was its randomized controlled design, which allowed direct comparison between two commonly used conservative interventions. The use of validated outcome measures, including the Visual Analog Scale and Oral Health Impact Profile, strengthened the assessment of pain and oral health-related quality of life. The use of assessor blinding also helped reduce measurement bias. Another strength was the practical clinical relevance of the interventions, as both mobilization therapy and occlusal splint therapy are widely used in routine TMD management and can be applied in real-world clinical settings. Despite these strengths, the findings should be interpreted with caution. The sample size was small, which limited statistical power and reduced the generalizability of the results. The study duration was also limited to six weeks, so the long-term sustainability of treatment effects could not be determined. Although random allocation was performed, participants were recruited through non-probability convenience sampling, which may have introduced selection bias. The study also focused mainly on pain and oral health-related quality of life, while the objective included functional ability. A specific functional outcome measure, such as maximum mouth opening, jaw range of motion, Jaw Functional Limitation Scale, or Mandibular Function Impairment Questionnaire, was not reported. This limited the ability to fully explain functional recovery. In addition, details regarding TMD subtype, bruxism status, psychological factors, medication use, adherence to home exercises, and splint compliance were not fully described, although these factors could influence treatment response.

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Future studies should include larger sample sizes, multicenter recruitment, longer follow-up periods, and more detailed classification of TMD subtypes. Future trials should also include objective functional outcomes such as mouth opening, lateral jaw movement, chewing ability, and jaw disability scores, along with pain and quality-of-life measures. Monitoring treatment adherence, home exercise compliance, and splint wearing time would strengthen the reliability of intervention-related conclusions. Further research may also compare combined mobilization and occlusal splint therapy with each intervention alone, as TMD often involves both musculoskeletal and parafunctional components. Overall, the present study showed that both mobilization and occlusal splint therapy were beneficial for TMD management, while mobilization therapy demonstrated greater short-term improvement in pain intensity and oral health-related quality of life.

CONCLUSION

The study concluded that both mobilization therapy and occlusal splint therapy were effective conservative approaches for managing temporomandibular disorders, particularly in reducing pain and improving oral health-related quality of life. However, mobilization therapy showed greater overall benefit, suggesting that manual therapy may be more useful when treatment aims to restore joint mobility, reduce muscular tension, and improve daily jaw-related function. Occlusal splints remained a valuable option, especially for patients with parafunctional habits, but their effects appeared comparatively less pronounced. These findings support the practical use of mobilization therapy as an effective short-term rehabilitation strategy for TMD management, while future research with broader samples and longer follow-up should further explore long-term outcomes and the value of combined treatment approaches.

AUTHOR CONTRIBUTION

Author	Contribution
Ishrat Bibi	Conceptualization, data collection, data analysis, manuscript writing, and interpretation of results.
Dr. Muhammad Naveed Babur	Supervision, methodology guidance, critical review, and final approval of the manuscript.

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