

COMPARATIVE EFFECTIVENESS OF MANUAL THERAPY AND ROKABADO TECHNIQUES IN THE MANAGEMENT OF TEMPOROMANDIBULAR JOINT DYSFUNCTION: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: TMJ Dysfunction are trauma to the jaw, such as a blow to the face or a sudden impact, can cause TMJ dysfunction. The occurrence rate of temporomandibular joint (TMJ) dysfunction approximately 31% of adults and elderly individuals experience TMJ dysfunction, with disc displacement with reduction (DDwR) being the most common condition, affecting around 25.9% of this population

Objective: To determine which treatment technique (either manual therapy or Rokabado techniques) is more effective in reducing pain and improving jaw function in patients with TMJ dysfunction

Methods: The design of this study was Randomized controlled trial (RCT). Data was collected from Physiotherapy and Rehab center shadrah, lahore. Based on these calculations, the calculated total sample size to check statistically main differences was 38 participants. However, to account for an expected 10% withdrawal rate during the study, the sample size is set to 42 participants to maintain the urge power, a 5% margin of error, and 95% power, as calculated by G-Power version 3.1.9.7. Each participant was randomized into either the Group A (Manual therapy) or ROKABADO techniques was perform in group B. One conciliator and one examiner participated in this study. In addition, the examiner was unsure of in which classified subjects were chosen. Pain, Rom were examined by the examiner before and after treatment. Participants of both group warmed up by hot packs for 5 minutes.

The evaluator, who was blinded to measures given to each group, measured the ROM, and pain intensity around one minute after this warm up. The intensity of pain was assessed on a 11 points Numeric Pain Rating Scale (NPRS) in each patient. The pain free maximal distance between the incisal edges of the mandibular central incisor and the maxillary central incisor is referred to as the maximal mouth opening and was measured by Therabite scale.

Results: The Mann–Whitney U test was applied to compare outcomes between Manual Therapy (Group A) and Rocabado Technique (Group B) in a total sample of 38 participants. At baseline, no statistically important differences were observed between groups for pain ($p = 0.205$) and maximum mouth opening (MMO) ($p = 1.000$), indicating similarity. However, post-treatment analysis shows important differences ($p < 0.01$), with Group A explain marked decrease in pain (10.79 ± 0.205) compared to an increase in Group B (28.21 ± 0.536). Similarly, MMO significantly improved in Group A (28.61 ± 0.543), while it decreased in Group B (10.39 ± 0.197). The Z-values further supported these findings, show a stronger treatment effect of Manual Therapy over the Rocabado Technique.

Conclusion: Group A show a maint reduction in pain and a marked improvement in mouth opening (MMO), whereas Group B showed less favorable changes. Therefore, Manual Therapy can be considered a more effective treatment for reducing pain and improving functional mouth opening in the studied population

Keywords: Manual, Therapy, Rocabado, Temporomandibular Joint, Dysfunction

INTRODUCTION

The temporomandibular joint (TMJ) is a complex joint that attaches the jawbone to the skull, playing a role in assisting movements such as chewing, speaking, and yawning. (1)The occurrence rate of temporomandibular joint (TMJ) dysfunction approximately 31% of adults and elderly individuals experience TMJ dysfunction, with disc displacement with reduction (DDwR) being the most common condition, affecting around 25.9% of this population. (2)The widespread rate of TMJ dysfunction in children and adolescents is lower, at around 11%, with DDwR affecting about 7.4% of this age group. (3) Specifically, those between 20 and 40 years old. Causes of TMJ Dysfunction are trauma to the jaw, such as a blow to the face or a sudden impact, can cause TMJ dysfunction. Grinding or clenching the teeth can put extra stress on the TMJ, leading to dysfunction. Poorly aligned teeth or a bad bite can cause extra stress on the TMJ, leading to dysfunction.(4)Temporomandibular joint dysfunction (TMD) represents a group of musculoskeletal and neuromuscular conditions affecting the temporomandibular joint (TMJ), masticatory muscles, and associated structures.(5)Overactivity and abnormal habits like clenching or clenching lead the muscles

spasm and ischemia caused muscular impairment in TMJ. This results in the accumulation of metabolic byproducts such as lactic acid, causing pain and tenderness. Functional limitation and reduced range of motion are caused by prolonged muscles tension. Additionally, altered neuromuscular control can impair coordination between the jaw muscle increase the abnormality.(6)Displacement and dysfunction of articular disc are another pathological features of internal disturbance of TMJ. In normal conditions, during jaw movement disc move together with mandibular condyle. However, in TMD, the disc may become displaced anteriorly or medially, leading to disc displacement with or without reduction. (7) Trauma to the jaw can cause TMJ dysfunction. Manual therapy plays a significant role in the treatment of temporomandibular joint (TMJ) dysfunction. It involves the use of skilled, hands-on techniques to improve joint mobility, reduce pain and inflammation, and promote relaxation. Manual therapy can help reduce pain and discomfort associated with TMJ dysfunction. Manual therapy can help improve range of motion and reduce stiffness in the TMJ. (13) By incorporating manual therapy into treatment plans, healthcare

professionals can help individuals with TMJ dysfunction achieve optimal outcomes and improve their quality of life.(14)Rocabado techniques are a set of manual therapy approaches developed by Mariano Rocabado, a physical therapist who specialized in the treatment of temporomandibular joint (TMJ) disorders. These techniques focus on addressing the complex interplay between the TMJ, surrounding muscles, and cervical spine. Gentle mobilization of the TMJ to improve joint mobility and reduce stiffness .Stretching of the muscles surrounding the TMJ, including the masseter, temporalis, and medial pterygoid muscles.TMJ symptoms due to cervical spine dysfunction can be treated by mobilization of cervical spine.By incorporating Rocabado techniques into treatment plans, healthcare professionals can help individuals with TMJ dysfunction achieve optimal outcomes and improve their quality of life.(16)

METHODOLOGY:

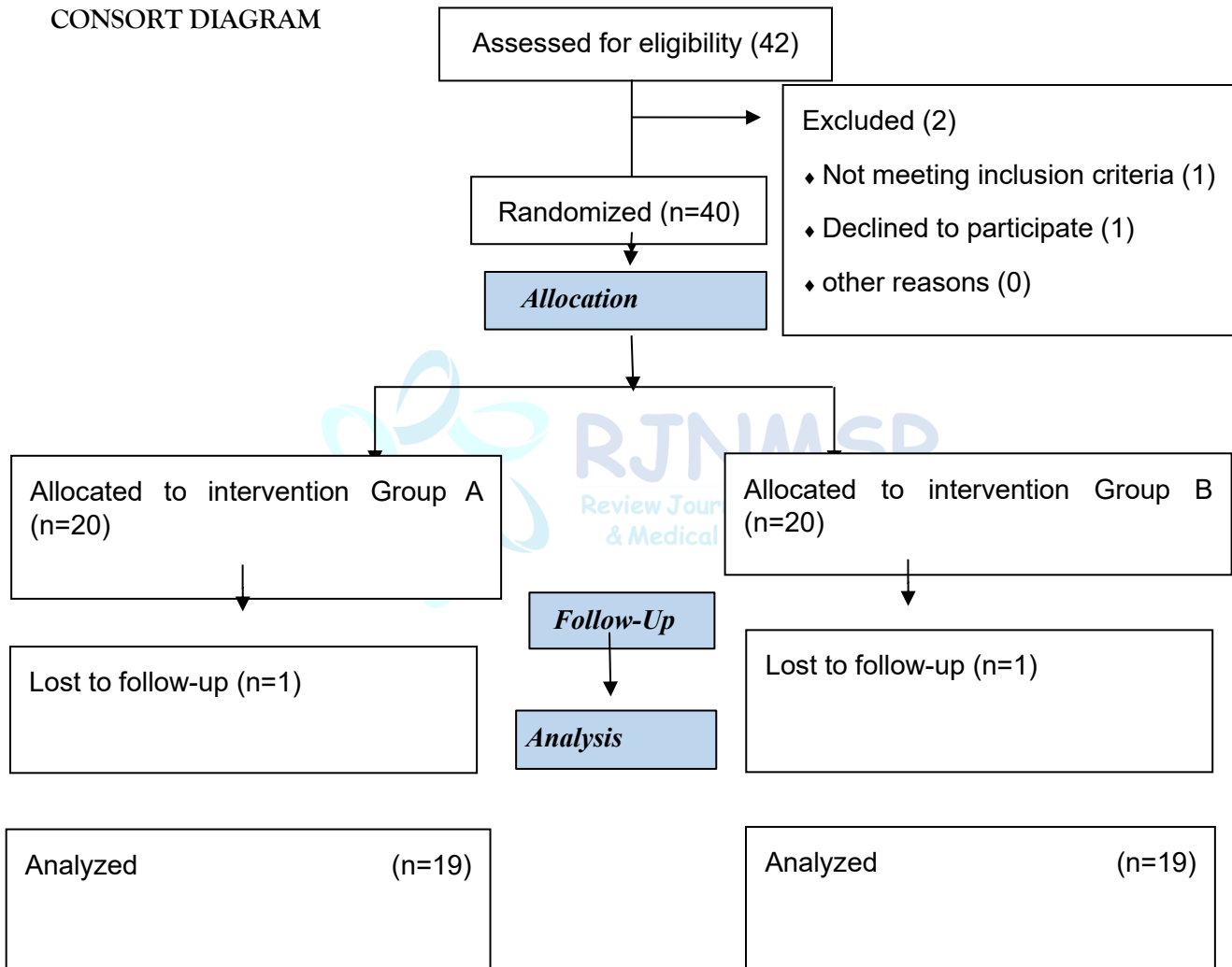
The design of this study was Randomized controlled trial (RCT).Data was collected from Physiotherapy and Rehab center shadrah, lahore. The study's sample size was determined using a paired t-test with a 95% confidence level, 0.95 power, and an effect size of 1.2140005. The parameters included a mean of 6.91for group 1 ,5.93for group 2, standard deviations of for group 1 is 0.37 and 1.08 for group 2. Based on these calculations, the calculated total sample size to asses statistically important differences was 38 participants. However, to account for an expected 10% dropout rate during the study, the sample size is adjusted to 42 participants to maintain the desired power, a 5% margin of error, and 95% power, as calculated by G-Power version 3.1.9.7.(21)Sampling technique used was non probability Sampling technique.The duration of this study was10 months. **Selection criteria includes** Adults aged 18 to 50 years(15) Clinically diagnosed with Temporomandibular Joint Dysfunction (TMD) based on Research Diagnostic Criteria for TMD (RDC/TMD) or DC/TMD guidelines. Experiencing TMD-related pain or dysfunction for at least 4 weeks.(23) **Exclusion Criteria includes** History or presence

of systemic diseases affecting the musculoskeletal or neurological systems (e.g., rheumatoid arthritis, fibromyalgia, multiple sclerosis).(13) A total of 38 patients were screened according to inclusion criteria. After the data collection, the data was be analyzed through SPSS-27.Participants of both group warmed up by hot packs for 5 minutes. The examiner who was blinded to treatment given to each group, measured the ROM, and pain intensity around one minute after this warm up. **Group A: Manual Therapy Intervention** :This approach involves hands-on techniques to improve joint mobility, reduce pain and inflammation, and enhance overall function. Manual therapy can include various techniques, such as joint mobilization, soft tissue mobilization, and muscle energy techniques. Group A was treated with Manual Therapy for 40 minutes for 3 sessions per week for 6 weeks.(1, 13) **1. Soft Tissue Mobilization:** Targeting masseter, temporalis, and pterygoid muscles Deep friction and longitudinal massage techniques for 10 minutes per session.**2. Trigger Point Therapy:** Manual pressure applied to trigger points in masticatory muscles .Helps reduce referred pain and muscle tightness .For 5-7 minutes per session **3. Myofascial Release:** Sustained pressure applied to facial fascia. Aimed at relieving fascial limitation and improving tissue mobility. 5 minutes per session **4. TMJ Joint Mobilization** : Maitland Grade I-III techniques (anterior, inferior, and lateral glides) .To improve joint play and mouth opening .3 sets of 30-second mobilizations with rest. 10 minutes per session **5. Cervical Spine Mobilization:** Grade I-II mobilizations at upper cervical vertebrae (C0-C3) .For postural correction and muscular relaxation. 5 minutes per session. **Group B: Rocabado 6x6 Exercise Program:** Developed by Mariano Rocabado, these techniques focus on improving TMJ mobility, reducing pain, and enhancing quality of life. Rocabado's approach includes six exercises. Group B was treated with Rocabado techniques for 40 minutes for 3 sessions per week for 6 weeks.(21, 28) **The Rocabado 6x6 Exercise Protocol:** Participants were performed 6 specific exercises, 6 times per day, every day, for 6 weeks. **1. Resting Tongue Position** :Tongue placed lightly

on the palate behind the upper front teeth .Reinforced throughout the day during rest and activity. **2. Controlled Nasal Diaphragmatic Breathing:** Slow, nasal inhalation and exhalation with relaxed jaw and correct tongue posture .6 repetitions per session. **3. Rhythmic Stabilization Exercises:** Controlled mandibular opening and closing without deviation .6 repetitions per session. **4. Mandibular Condyle Distraction /**

Controlled Opening: Isometric resistance during gentle mouth opening, guided by tongue-on-palate technique .6 repetitions per session. **5. Head Posture Correction (Chin Tucks):** Cervical retraction to align ears over shoulders .Hold for 6 seconds, repeat 6 times per session. **6. Shoulder Girdle Retraction:**Scapular squeeze (bringing shoulder blades together) .Hold for 6 seconds, repeat 6 times per session.

CONSORT DIAGRAM



A total of 38 participants were equally classified into two groups, with 19 individuals in each group. In Group A (Manual Therapy), males constituted 63.2% (n=12) while females accounted for 36.8% (n=7), show a majority. In contrast, Group B (Rocabado Technique) showed a more balanced gender distribution, with 52.6%

males (n=10) and 47.4% females (n=9). The mean ± standard deviation values for gender (Group A: 1.37 ± 0.496; Group B: 1.47 ± 0.513) further reflect minimal variation between the groups. Overall, the gender distribution across both groups appears relatively comparable, recommended that gender is unlikely to important influence or confound the comparative effectiveness of manual therapy and

Rocabado techniques in the management of temporomandibular joint dysfunction.

Table 1: Statistics description of gender

| GENDER | | Frequency | Percent | Mean | Std deviation |
|--------------------------|--------|-----------|---------|------|---------------|
| A (MANUAL THERAPY GROUP) | MALE | 12 | 63.2 | 1.37 | .496 |
| | FEMALE | 7 | 36.8 | | |
| | Total | 19 | 100.0 | | |
| B (Rocabado GROUP) | MALE | 10 | 52.6 | 1.47 | .513 |
| | FEMALE | 9 | 47.4 | | |
| | Total | 19 | 100.0 | | |

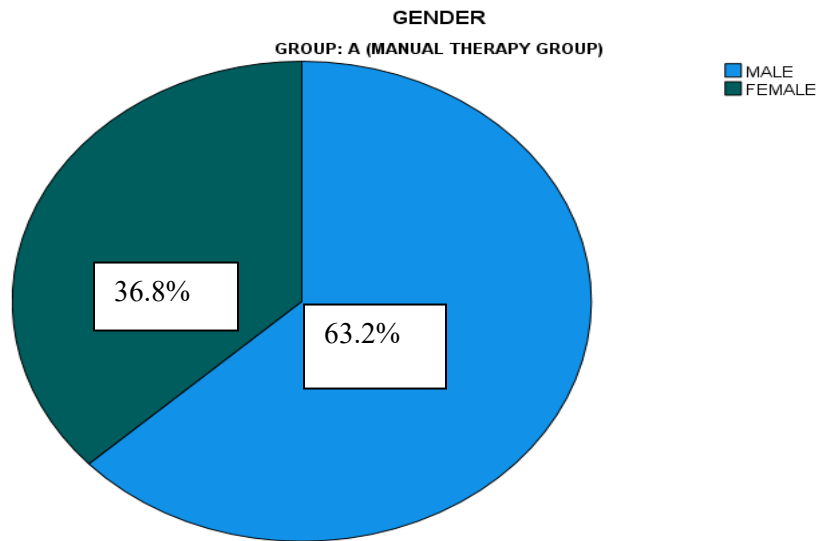


Fig 1: Graphical description of gender

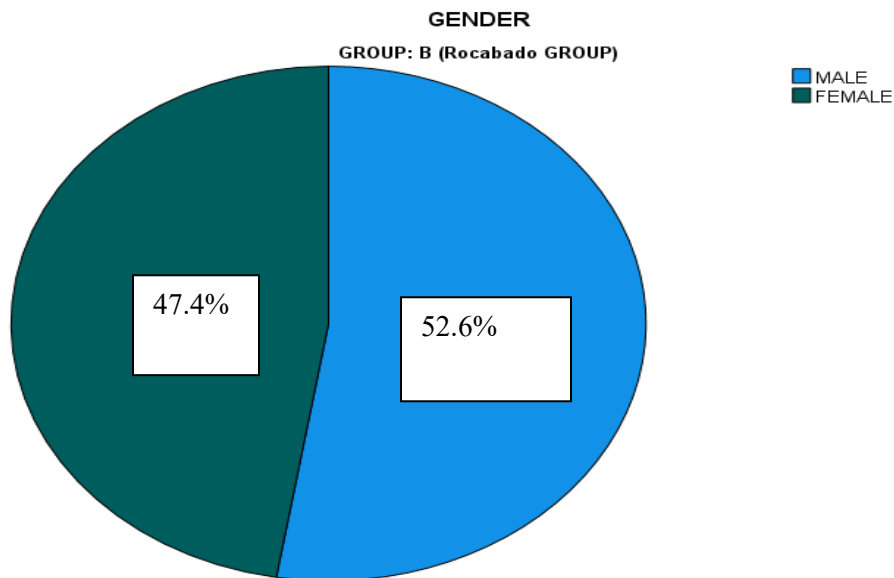


Fig 2: Graphical description of gender

Table 2: Normality Test

| Shapiro-Wilk | | | |
|--------------|-----------|----|------|
| | Statistic | Df | Sig. |
| PRE_PAIN | .922 | 38 | .011 |
| POST_PAIN | .925 | 38 | .014 |
| PRE_MMO | .927 | 38 | .016 |
| POST_MMO | .941 | 38 | .045 |

The normality of the data was assessed using the Shapiro-Wilk test. The results showed that all variables, including pre- and post-treatment pain and maximum mouth opening (MMO), had p-values less than 0.05. This indicates that the data

were not normally distributed and deviated significantly from a normal distribution. Therefore, the assumption of normality was violated, justifying the use of non-parametric statistical tests for further analysis.

Table 3: within group analysis Wilcoxon Signed Rank Test

| Wilcoxon Signed Rank Test | | | |
|---------------------------|------|---------------|---------|
| Within group analysis | Mean | Std deviation | P-value |
| Pre pain | 6.8 | 1.08 | .000 |
| Post pain | 3.5 | 1.69 | .000 |
| Pre mmo | 32.4 | 1.51 | .000 |
| Post mmo | 38.6 | 2.62 | .000 |

The Wilcoxon Signed-Rank Test is a non-parametric test used to compare paired samples when the data are not normally distributed. pre- and post-treatment changes in pain and MMO scores were evaluated in this study. The results show a statistically significant reduction in pain, with mean values decreasing from 6.8 (pre) to 3.5 (post) ($p = .000$). Similarly, MMO showed a significant improvement, increasing from 32.4 (pre) to 38.6 (post) ($p = .000$). These findings show that the treatment had a significant effect in reducing pain and improving mouth opening (MMO) in the study participants. For pain intensity, the pre-treatment mean score was 6.8 ± 1.08 , which mainly reduced to 3.5 ± 1.69 after intervention. This reduction was statistically significant ($p = 0.000$, $p < 0.001$), indicating a significant improvement in pain levels. For mouth opening (MMO), the pre-treatment mean value was 32.4 ± 1.51 mm, which significantly increased to 38.6 ± 2.62 mm post-treatment. This improvement was also statistically significant ($p =$

0.000 , $p < 0.001$), showing enhanced functional mouth opening after treatment. Overall, both variables explained statistically significant improvement after treatment, confirming the effectiveness of the treatment in decreasing pain and improving MMO in patients with temporomandibular joint dysfunction. The table presents results of the Wilcoxon Signed-Rank Test used for paired comparisons of pre- and post-treatment result. It includes mean, standard deviation, and p-values for pain and MMO. For pain, the mean score decreased from 6.8 (SD = 1.08) at pre-test to 3.5 (SD = 1.69) at post-test, with a p-value of .000, indicating a statistically significant reduction in pain. For MMO, the mean increased from 32.4 (SD = 1.51) at pre-test to 38.6 (SD = 2.62) at post-test, also with a p-value of .000, showing a statistically significant improvement in mouth opening. Overall, the results recommended that the technique was effective in reducing pain and improving MMO.

Table 4: Between groups analysis Mann-Whitney Test

| GROUP | Mean | Mean | Std deviation | Z | P-Value |
|-----------|--------------------------|-------|---------------|--------|---------|
| PRE_PAIN | A (MANUAL THERAPY GROUP) | 21.68 | .412 | -1.267 | .205 |
| | B (Rocabado GROUP) | 17.32 | .329 | | |
| POST_PAIN | A (MANUAL THERAPY GROUP) | 10.79 | .205 | -4.928 | <0.01 |
| | B (Rocabado GROUP) | 28.21 | .536 | | |
| PRE_MMO | A (MANUAL THERAPY GROUP) | 19.50 | .370 | 0.01 | 1.000 |
| | B (Rocabado GROUP) | 19.50 | .370 | | |
| POST_MMO | A (MANUAL THERAPY GROUP) | 28.61 | .543 | -5.097 | <0.01 |
| | B (Rocabado GROUP) | 10.39 | .197 | | |

The Mann Whitney U test was applied to compare the effects of Manual Therapy (Group A) and Rocabado Technique (Group B) on pain and mouth opening (MMO). For pre-treatment pain (PRE_PAIN), no statistically main difference was examined between the groups ($p = 0.205$), indicating that both groups were comparable at baseline, with mean pain scores of 21.68 in Group A and 17.32 in Group B. Similarly, pre-treatment MMO (PRE_MMO) showed no difference between groups ($p = 1.000$), with identical mean values of 19.50, confirming baseline homogeneity. However, post-treatment results explained main differences. In POST_PAIN, a statistically significant difference was found ($p < 0.01$), where Group A showed main reduction in pain (mean = 10.79), while Group B exhibited an increase in pain (mean = 28.21). Likewise, POST_MMO also showed a significant difference ($p < 0.01$), with Group A explaining a improved mouth opening (mean = 28.61) compared to a decrease in Group B (mean = 10.39). The Z-values further support the magnitude and direction of these differences, show stronger post-treatment. effects favoring

Manual Therapy. At baseline, both groups were statistically comparable for pain and mouth opening. For pre-treatment pain (PRE_PAIN), Group A (Manual Therapy) had a mean score of 21.68 ± 0.412 , while Group B (Rocabado) had 17.32 ± 0.329 , showing no significant difference between groups ($p = 0.205$). For post-treatment pain (POST_PAIN), a important difference was observed between groups ($p < 0.01$). Group A showed a marked decrease in pain to 10.79 ± 0.205 , whereas Group B showed an increase in pain to 28.21 ± 0.536 . For pre-treatment MMO (PRE_MMO), both groups had identical baseline values of 19.50 ± 0.370 , with no significant difference ($p = 1.000$), indicating equal starting conditions. For post-treatment MMO (POST_MMO), a statistically significant difference was observed ($p < 0.01$). Group A improved mouth opening to 28.61 ± 0.543 , while Group B decreased to 10.39 ± 0.197 . The Z-values supported the statistical significance of these differences, present a strong effect in post-treatment. Results favoring Group A (Manual Therapy).

DISCUSSION

The present randomized controlled trial was examined to compare the effectiveness of Manual Therapy and Rocabado Technique in patients with temporomandibular joint dysfunction (TMD). The study findings explained that both groups were statistically comparable at baseline in terms of pain intensity and maximum mouth opening (MMO), confirming appropriate randomization and similarity between groups. However, post-intervention analysis revealed a significant difference between groups, with Manual Therapy showing superior improvement in both pain reduction and functional jaw opening compared to the Rocabado Technique. These findings suggest that manual therapeutic interventions may provide more immediate and clinically meaningful benefits in the management of TMD when compared to exercise-based rehabilitation alone.

The results of the present study are consistent with recent proved in the literature supporting the effectiveness of manual therapy in TMD management. Seyhan et al. (2023) et al. Examined a randomized controlled trial evaluating the effects of physiotherapy-based treatment in patients with temporomandibular disorders. Their findings indicated that structured physiotherapy programs, including manual therapy techniques, significantly improved pain intensity, mandibular function, and quality of life. The authors highlighted that manual techniques contribute to neuromuscular re-education, reduction of muscle hyperactivity, and restoration of joint biomechanics. These physiological mechanisms closely align with the result of the present study, where the Manual Therapy group explained large decrease in pain and marked improvement in MMO. Furthermore, Seyhan et al. emphasized that early measures with manual techniques leads to faster symptomatic relief, which may explain the superior short-term result analyzes in Group A of the current study.(29)

In contrast, Rocabado exercises primarily focus on neuromuscular retraining, postural correction, and cervical-jaw coordination. While these exercises are theoretically effective in restoring functional balance, they require

consistent repetition, patient motivation, and long-term adherence to produce significant clinical outcomes. The lack of supervised training or poor practice may mainly reduce their effectiveness. The unexpected worsening of outcomes observed in the Rocabado group in the present study may indicate improper execution of exercises, lack of adherence, or insufficient duration of intervention. It is also possible that patients with acute or moderate TMD symptoms may respond more favorably to passive treatment such as manual therapy rather than active exercise-based protocols in the short term.(36)

The findings of the present study also have important clinical significance. They suggest that manual therapy should be considered as a primary treatment in the early management of temporomandibular joint dysfunction, particularly for patients presenting with moderate to severe pain and restricted mouth opening. However, exercise-based techniques should not be ignored totally as they may play an important role in long-term rehabilitation and prevention of reoccur when used appropriately and under supervision. A combined approach combine the both manual therapy and structured exercise programs may potentially yield the most optimal outcomes in TMD management.

CONCLUSION

The study shows that both groups were comparable at baseline, as no significant differences were found in pre-treatment pain and MMO values. However, post-treatment results show that Manual Therapy (Group A) was significantly more effective than the Rocabado Technique (Group B) in improving outcomes. Group A demonstrated a significant decrease in pain and a marked improvement in mouth opening (MMO), whereas Group B showed less favorable changes. Therefore, Manual Therapy can be considered a more effective intervention for reducing pain and improving functional mouth opening in the studied population.

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