



A Comparative Study on Effectiveness of Rocabado Approach and Conventional Physiotherapy on Pain, ROM and QOL in Patients with TMJ Dysfunction

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Authors' contributions

This work was carried out in collaboration among all authors. All authors made equal and best contribution for the concept, assessment and evaluation, data acquisition and analysis and interpretation of the data. Author SP has contributed in collecting data and analyzing and recording the results. Author DP has guided throughout the study and gave valuable opinions and author WN has suggested the idea of the study. All authors read and approved the final manuscript.

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ABSTRACT

Background: Temporomandibular joint disorder or dysfunction (TMD) are considered to be a subclass of the musculoskeletal disorders, so requires physiotherapy treatment. Till now very few studies have been done show the effectiveness of Rocabado approach and conventional physiotherapy, so the research aims to compare the effects of same in patients having mild to moderate Temporomandibular joint disorder.

Methods: Subjects (n = 60) with TMJ dysfunction were selected for a comparative study. The participants were randomized into (1) Group A, and (2) Group B. Participants of Group A received Rocabado approach while Group B received the conventional physiotherapy along with home exercises for a period of 8 days immediately following baseline assessment.

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Discussion: The aim of the study was to compare the effectiveness of Rocabado approach and TENS in the patients having mild to moderate Temporomandibular joint disorder. To conclude, we can say that the current study found evidence to justify the application of Rocabado's technique to TMJ mobility. It helps patients with TMJ problems having mild to moderate dysfunction to improve their discomfort, mouth opening and quality of life.

Keywords: TMJ dysfunction; rocabado exercises; TENS; fonseca questionnaire; NPRS.

1. INTRODUCTION

The term Temporo-mandibular joint disorder (TMD) describes a group of conditions, that occurs in the region of temporo-mandibular, which is represented by pain in the temporo-mandibular joint (TMJ) or in masticatory muscles, or in both [1]. In about 20% to 85% of the population, there is prevalence of TMD with an incidence of more among female, i.e., 6.3% than male, i.e., 2.8% [2]. and is commonly found in population with 20 to 40 years of age group [3]. TMJ disorder mostly occurs because of any injury to jaw, overuse of muscles or inflammation such as with arthritis [4]. TMJ related disorders causes symptoms which are- pain in the ear, face, jaw, and neck, pain during chewing, sounds in the jaw like popping or clicking while opening or shutting the mouth, headaches, locking of jaw and TMJ joint ROM is limited [5]. The pathophysiology of Temporomandibular joint disorder is unknown. Physical (trauma, muscle spasms, chronic malocclusion, bruxism, or tooth grinding or clenching), biochemical (vitamin deficiency), and physiological (anxiety, stress, and depression) variables may all be involved [6]. Before considering invasive, semipermanent, or permanent treatments (such as orthodontics or surgery) that have the potential to cause irreversible injury, non-invasive therapies should be tried first [7]. Pharmacological treatment (nonsteroidal anti-inflammatory drugs, muscle relaxants, antidepressants, and corticosteroids), oral appliances, home care procedures, cognitive-behavioural information programme, acupuncture, and dry needling, chiropractic, physical therapy, osteopathy, relaxation, and meditation are all examples of non-invasive therapies [8]. The goal of physical therapy is to alleviate musculoskeletal discomfort, reduce inflammation, and restore oral motor function [9]. Physical therapy (electrophysical modalities, therapeutic exercises, and manual therapy techniques), according to the American Academy of Craniomandibular Disorders and the Minnesota Dental Association, is an important treatment for musculoskeletal pain relief and inflammation reduction and restore oral motor

function [10]. Electrophysical methods (shortwave diathermy, ultrasound, biofeedback, microwave, laser therapy, and transcutaneous electrical nerve stimulation), acupuncture, therapeutic exercises for the masticatory and cervical muscles, and manual therapy techniques are among the treatments available [11]. Transcutaneous electrical nerve stimulation (TENS), is a device, which works as a therapy that uses low-frequency current, for treating acute and chronic pain. Through the administration of electrical current via electrodes linked to the skin, the device relaxes overactive muscles and reduces or eliminates pain [12]. Dr. Mariano Rocabado, has extensively studied TMD and developed a 6 x 6 exercise program which means that there are 6 types of exercises, which are to be performed 6 times in a day with 6 repetitions of each exercise that plays a crucial role in treating Temporomandibular joint disorder [13]. These 6 exercises are- rest position of the tongue, shoulder posture correction, stabilization of head flexion, axial extension of the neck, controlled TMJ rotation, and rhythmic stabilization technique which emphasized on the head-to-neck, neck-to-shoulder, and lower jaw-to-upper jaw postural relationships [14]. Rocabado's approach comprises of Rocabado's exercises and TMJ manipulation (non-thrust). The purpose of TMJ manipulation is to help relieve the tension from the soft tissues and to normalize the ROM in the jaw, neck and head covering this entire region [15]. The Rocabado's 6 x 6 exercise programme has also been found to be beneficial in reducing pain and increasing masticatory muscle function, as well as improving forward head posture, restoring restricted joint mobility, muscle length limitation, and postural and functional limitations [16]. Till now, very few studies have done to prove the effect of Rocabado's approach, and it is a matter of question that why the approach is not purely used in the treatment of TMJ dysfunction and also no study have shown the comparative effects of TENS and Rocabado's approach in patients having mild to moderate TMJ dysfunction, so the goal is to prove the same using range of motion (ROM) for mouth opening,

numerical pain reading scale (NPRS) for pain, Oral Health Impact Profile (OHIP-14) for Quality of life and Fonseca Questionnaire to determine the severity of TMJ dysfunction.

2. MATERIALS AND METHODS

The study followed the tenets of the Declaration of Helsinki. The study was carried out from the duration July 2020 to May 2021 in the Department of Musculoskeletal Sciences, Ravi Nair Physiotherapy College, Sawangi (Meghe), Wardha. The study is a comparative study, with 60 patients. The technique used for sampling was stratified random sampling. Materials used for the study was- TENS machine with electrodes, ultrasonic gel, cotton, gloves and consent form. Patients who were willing to participate in the process, with mild to moderate TMJ dysfunction, according to Fonseca Questionnaire, ranging in the age group of 20 to 50 years, with both male and female were included in the study. And those who do not fall in the mentioned age group, with severe TMJ dysfunction according to Fonseca Questionnaire and with recent oral surgeries were excluded from the study. After satisfying inclusion and exclusion criteria the patient was authorized to take part in the research. They were provided with the informed consent, according to which they can opt out any time. A total of 67 TMD patients were assessed for the study, with 7 refusing to continue the therapy. As a result, there were 60 participants in this study. Before splitting the individuals into two groups, the technique was thoroughly explained to all of the eligible subjects, and they gave their informed consent. After randomization they were split into two groups - Group A (n=30) and Group B

(n=30). The pre assessment were taken on 0th day and post assessment were taken on the last day of the treatment, i.e., on 8th day for all outcome measures such NPRS for measuring pain, Fonseca questionnaire to classify TMD severity, 15cm normal measuring scale for ROM of mouth opening and OHIP-14 for quality of life.

In Group A: Rocabado's approach was given to the patients in this group which includes Rocabado's 6X6 exercise program and Joint mobilisation. Joint mobilization can be performed, when TMJ is restricted, in various directions to improve the joint's mobility, it includes- Distraction, Distraction given with anterior glide, Distraction given with anterior and lateral glide right/left & Lateral glide without distraction. Rocabado's 6X6 program also includes 6 fundamental components, that are- rest position of the tongue, TMJ rotation control, liberation of the cervical spine, shoulder girdle retraction and rhythmic stabilization technique. The group received treatment for a week.

Group B: The subjects in this group received TENS. As the patients were with mild to moderate TMJ dysfunction, so Conventional TENS was used with a frequency between 50-100 Hz, small pulse width (50-200us) and low intensity, which was given for 10 mins a day for a period of 8 days. 2 channel electrodes were given along the TMJ. Along with TENS some home exercises were also given to relieve pain as well as to strengthen the TMJ, which includes- relaxed jaw exercise, goldfish exercise (partial/full opening), chin tucks, resisted opening and closing of the mouth, tongue up, side-to-side jaw movement, and forward jaw movement.



Fig: A) Rocabado mobilisation, B) TENS application

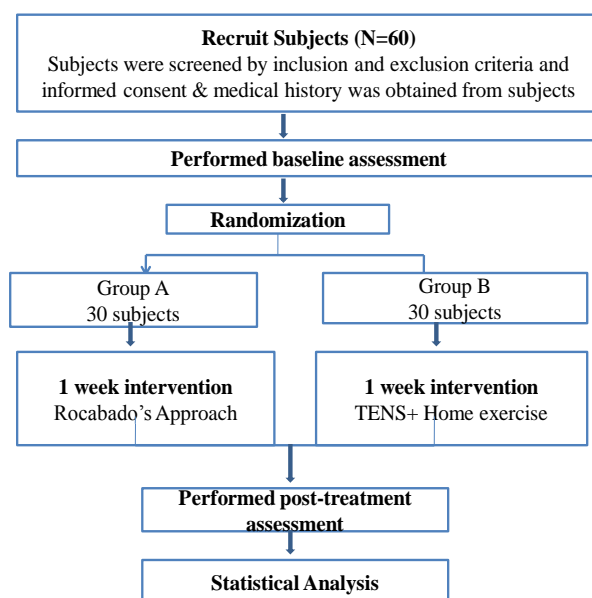


Fig C. Flowchart of Study Design (19)

3. OBSERVATION AND RESULTS

Means and standard deviation were computed as part of descriptive statistics. Statistical analysis was performed using descriptive and inferential statistics, including the chi-square test, student's paired and unpaired t-test, and SPSS 27.0 version and GraphPad Prism 7.0 version software, with a significance level of 0.05. Table 1/ Fig 1 displays the comparison of all the

outcome measures between both the groups n shows an improvement in the pain, TMJ dysfunction and quality of life, whereas the ROM is more improved in group A. Fig 2 displays the comparison of gender, which shows that the female patients were more in group A than in group B. Fig 3 which shows the age group, it is seen that the more patients were seen in the age group of 31-40 and 41-50 in group A.

Table 1. Comparison of NPRS score in two group pre and post operatively Student's paired t test

			Mean	N	Std. Deviation	Std. Error Mean	Mean Difference	t-value
NPRS	Group A	Pre t/t	6.91	30	0.37	0.06	4.68±0.83	30.70
		Post t/t	2.23	30	0.72	0.13		
	Group B	Pre t/t	5.93	30	1.08	0.19		
		Post t/t	1.73	30	0.69	0.12		
Fonseca Questionnaire Score	Group A	Pre t/t	49.23	30	12.68	2.31	14.36±5.46	14.40
		Post t/t	34.86	30	8.97	1.63		
	Group B	Pre t/t	53.96	30	5.50	1.00		
		Post t/t	48.73	30	6.12	1.11		
Quality-of-life OHIP Score	Group A	Pre t/t	15.46	30	1.96	0.35	5.36±1.84	15.91
		Post t/t	10.10	30	1.53	0.28		
	Group B	Pre t/t	16.63	30	2.29	0.41		
		Post t/t	13.56	30	2.35	0.43		
mouth opening(cm) ROM Score	Group A	Pre t/t	1.83	30	0.37	0.06	1.86±0.45	22.54
		Post t/t	3.70	30	0.31	0.05		
	Group B	Pre t/t	1.66	30	0.53	0.09		
		Post t/t	2.56	30	0.50	0.09		

Table 2. Distribution of patients according to age in years in two groups

Division	Age Group(yrs)	Group A	Group B	χ ² -value
AGE	21-30 yrs	7(23.33%)	18(60%)	8.65 p=0.013, S
	31-40 yrs	17(56.67%)	10(33.33%)	
	41-50 yrs	6(20%)	2(6.67%)	
	Total	30(100%)	30(100%)	
	Mean±SD	35.10±5.65	30.36±5.51	
GENDER	Male	15(50%)	16(53.33%)	0.06 p=0.79, NS
	Female	15(50%)	14(46.67%)	
	Total	30(100%)	30(100%)	

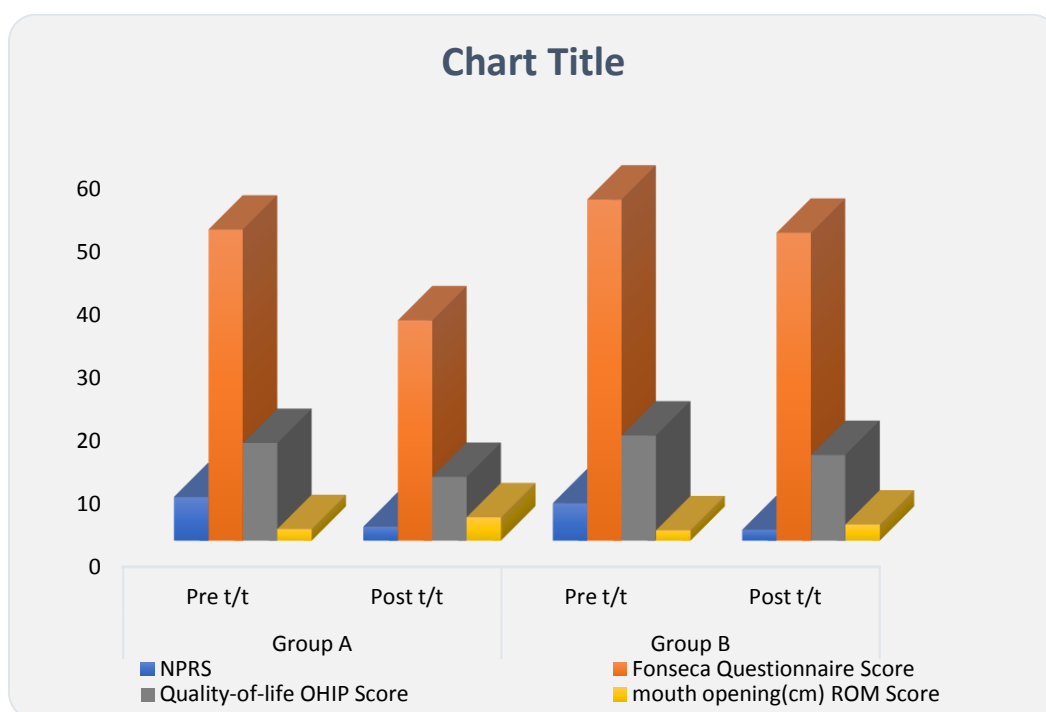


Fig. 1. Outcome measures

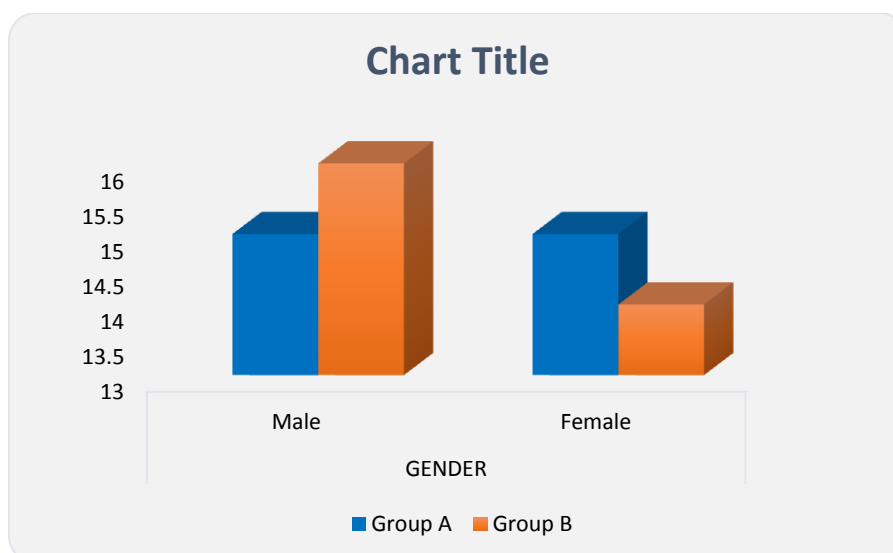


Fig. 2. Gender

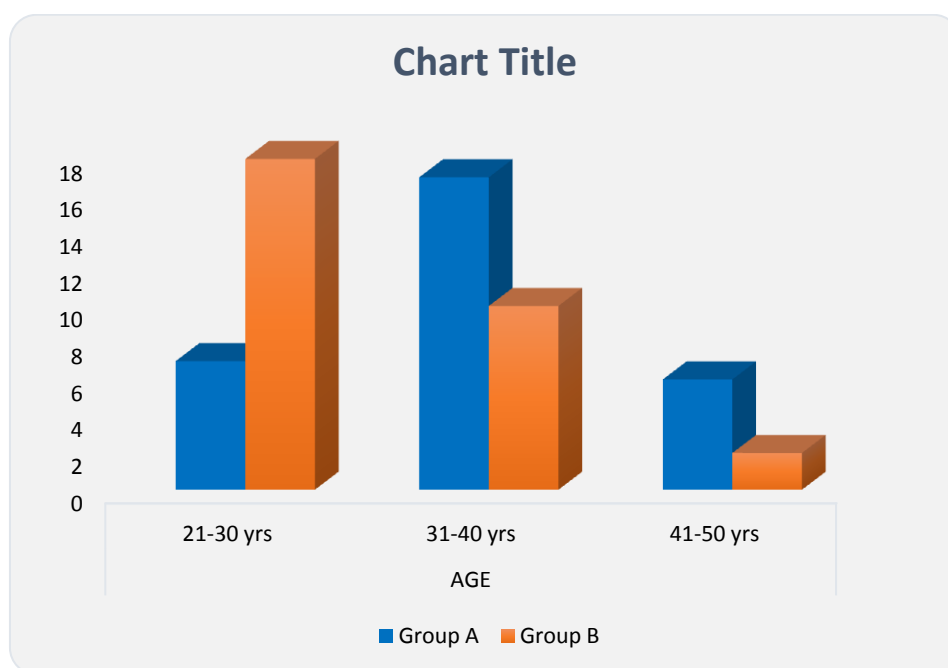


Fig. 3. Age group

4. DISCUSSION

The current study was conducted in Musculoskeletal department of RNPC to determine the effectiveness of Rocabado's approach in patients with mild to moderate TMJ dysfunction as compare to TENS. In this comparative study our aim was to the find the impact of Rocabado's approach on TMJ dysfunction patients and how it deals with pain, mouth opening and quality of life among them. The current study has Grade I and II patients of TMJ severity, according to Fonseca questionnaire, as such patients can get relieved with few days' treatment of Physiotherapy. A population between 21-50 years of age was selected as per the epidemiology of TMD patients. 30 patients in Group A who received Rocabado's approach and 30 patients in Group B who received TENS with home exercises were included in the study for a period of 8 days. Outcome measures such as- NPRS for pain, Fonseca questionnaire for severity of TMJ, ROM for mouth opening (in cm) and OHIP for QoL were used in pre and post treatment after which results were analysed to measure the effects.

From the analysis it was found that the Group A who received Rocabado's approach and the Group B who received TENS with home exercises for continuous 8 days have demonstrated a statistically & clinically significant

effect on TMD symptoms, such as- pain, ROM and QoL in patients. The outcomes of the research shows that the Rocabado's approach is more effective in patients as compare to conventional physiotherapy in long term. The mean data value from this research indicates that the patients in Group A showed better improvement in NPRS, Fonseca questionnaire, ROM and OHIP-14 for QoL of patients.

Rocabado's approach is found to be effective and should be applied in treating TMJ dysfunction patients. It consists of non- thrust manipulation of TMJ, in which glides are given and also 6X6 exercise which means it consists of 6 types of exercise, which are- Rest position of the tongue, Shoulder posture correction, Stabilization of head flexion, Axial extension of the neck, Controlled TMJ rotation, and Rhythmic stabilization technique which should be performed for 6 times a day with 6 repetitions of each exercise.

In a single-blind study by Niha Siraj Mulla et al. (2015), participants with TMD were randomised into two groups, each with 15 subjects, for a total of 30 subjects. The study group received Rocabado's treatment, which included Rocabado's non-thrust TMJ manipulation and Rocabado's exercises in addition to standard TMJ exercises, while the Group B received only standard TMJ exercises. According to the

findings, Rocabado's technique was statistically and clinically significant added effect with conventional TMJ exercises and showed greater percentage of improvements in reducing TMJ pain, increasing function of jaw and TMJ ROM comparing with only conventional TMJ exercises in subjects with TMD with restricted mouth opening mobility [17].

According to this study, it supports our result that Rocabado's approach is effective and should be applied in TMD patients.

TMD is found to be very common among young individuals. So accordingly, the study also had patients in the age group of 21-50 years of age, and were split up into three groups. In the first group we have in the age group of 21- 30 years, in second 31-40 years and 41- 50 years in the third group. The data shows about the distribution among two groups according to age in years and gender respectively using chi-square test. Our study also had patients in the young adult population, with almost same male and female ratio.

Many research has shown the effectiveness of some therapy resources in reducing pain and restoring masticatory muscle function. TENS merits special attention in this regard because it has no side effects and allows for pain reduction by using low frequency current to treat both acute and chronic pain.

In TMD patients one of the most important sign and symptom to look for is pain. Considering that TENS is a resource indicate to promote analgesia, a study was carried out by Delaine Rodrigues et. al, in 2004 to show the effect of TENS in TMD patients. One of the objectives of the study was to evaluate the effect of conventional TENS on pain in TMD patients also with the electromyographic activity of masticatory muscles. He came to the conclusion that TENS reduced pain and EMG activity of the anterior temporal muscle while enhancing masseter muscle activity during MVC. It is feasible to draw the conclusion that a TENS is an efficient pain reliever when used only once [15]. Our study also shows the comparison of NPRS score in two group pre and post operatively using Student's paired t- test, the Group B also showed improvements in pain after the application of TENS.

TMD among patients are divided according to the grades, such as mild, moderate and severe. In this study, we selected grade I and II TMD

patients, which is mild to moderate according to Fonseca questionnaire, as patients who fall in these grades can be treated just with physiotherapy intervention and can get relieved within few days of treatment. Because it is highly efficient in acquiring epidemiological data, the questionnaire proposed by Fonseca was utilised to classify TMD severity in the study population. The Fonseca questionnaire is structured in the manner of a comprehensive examination. It consists of ten questions, including screening for discomfort in the temporomandibular joint, head, back, and during chewing, parafunctional habits, movement limits, joint clicking, sense of malocclusion, and emotional stress experience. The volunteers were told that each question should be answered with a single word, "yes", "no" and "sometimes" as well as the fact that each question should only have one answer. There was no time constraint for finishing the task. Kariny NOMURA et. al in the year 2007 conducted a study on Assessment of the Prevalence and Severity of Temporomandibular Disorders in Brazilian Dental Undergraduates Using Fonseca's Questionnaire. The result proved that the Questionnaire allows for the identification of a TMD patients as well as the classification of the patient according to the severity of the condition.

One of the other outcome measures used in the study was Oral Health Impact Profile (OHIP-14) for quality of life in TMD patients. The state of one's oral cavity, as manifested by symptoms and indicators of oral disorders, can have a major impact on one's quality of life (QoL) (1). There are a number of multidimensional approaches for assessing these oral health-related QoL, with the OHIP-14 being one of the most popular. The OHIP-14 is a questionnaire containing 14 questions about mouth and teeth issues. The following response scale was used to evaluate each question: 4 denotes "quite often," 3 denotes "pretty often," 2 denotes "sometimes," 1 denotes "hardly ever," and 0 denotes "never." In a study conducted by Folake B Lawal et. al in the year 2014 in Nigeria, concluded that in an adult patient population in Ibadan, Nigeria, the OHIP-14 measure demonstrated good psychometric qualities, including face, content, construct, and criterion validity, as well as good internal consistency, and can be used to assess the impact of oral disorders on individuals.

Mouth opening is one of the major factors to be look for in patients with TMD. Restricted ROM is

also one of the signs and symptom seen in TMD patients. To check for the maximum mouth opening of the patients the commonest method is by the use of fingers. If the patient is able to take 3 fingers while opening mouth than his/ her range can be considered normal. Another method which we have used in the study is by using normal 15cm scale. Normal mouth opening according to the earliest study, carried out by Mezitis *et al.* in symptom free adults aged 18–70 years, men had a maximum interincisal distance of 52.85 mm, while women had a distance of 48.34 mm. After giving the intervention to the patients we have seen improvement in mouth opening from 2cm to even 5cm.

As there was an improvement in mouth opening, simultaneously the complaint of the patient related to the pain was also improving. For pain the commonly and one of the most important scale used by the physiotherapist is NPRS. A study conducted by Ratan Khuman *et. al.*, in the year 2013, he used NPRS as one of the outcome measures and there was clearly an improvement in patients complaining of pain [18].

Our study clearly shows the improvement just by the use of Rocabado's approach, whereas some studies have not shown the effect of the manual therapy alone. Therefore, future studies on the same and the application of the manipulation for TMJ is required to get a clearer picture.

5. CONCLUSION

In conclusion, the current study found evidence to justify the application of Rocabado's technique to TMJ mobility. It helps patients with TMJ problems having mild to moderate dysfunction to improve their discomfort, mouth opening, and quality of life.

CONSENT

It was obtained from the patients included in the study.

ETHICAL APPROVAL

The approval from Institutional Ethics Committee of Datta Meghe Institute of Medical Sciences, deemed to be University, with Reference No. DMIMS(DU)/IEC/2020-21/8969.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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