



## Estimation of Jaw Muscles Exercises Effectiveness in Comparison to Medication in Treating Patients with Temporomandibular Joint Disorders

Mahdi Mahmood ALSalih <sup>1</sup>, Hadeel Salman Alazzawi <sup>2</sup>, Atyaf Ghazi ALDawodi <sup>3</sup>

<sup>1,3</sup> Al-Noor Specialized Dental Center, Nineveh Health Directorate, Ministry of Health, Iraq

<sup>2</sup> Right Bank Specialized Dental Center, Nineveh Health Directorate, Ministry of Health, Iraq

### Article information

Received: June 12, 2022

Accepted: November 9, 2022

Available online: March 20, 2023

### Keywords

Temporomandibular joint disorder

Muscles exercise

NSAID

Muscle relaxant.

### \*Correspondence:

### E-mail:

mahdiasalih72@gmail.com

### Abstract

**Aims:** This clinical study is aimed at evaluating the effectiveness of exercise therapy in patients with temporomandibular joint disorder and comparing them with patients who take medications. **Materials and Methods:** 44 patients with temporomandibular joint disorder were divided into 2 groups, 22 patients were instructed to perform jaw exercises and the other 22 patients were given a non-steroidal anti-inflammatory drug and muscle relaxant. Clinical examination of joints and muscles, including pain, spasm, interincisal distance, and presence of locked joint. These were done pre and post-treatment within three visits. **Results:** clinically, there was no actual evidence in the exercise group and medication group, except for locked jaw relief in the exercise group. Statistically, showed no significant differences in variance after two visits between the two groups. **Conclusion:** there was not providing definite evidence of treatment efficacy in the short-time trial in patients with temporomandibular joint disorder. However, exercises are an effective treatment for a locked jaw than medical agents.

### الخلاصة

**الاهداف:** تهدف الدراسة السريرية الى تقييم فعالية تمارين العضلات للمرضى ومقارنته مع اخرين يتناولون الادوية. **المواد وطرائق العمل:** اربع واربعون مريضا باضطراب المفصل الصدغي تم تقسيمهم الى مجموعتين؛ المجموعة الاولى (22 مريض) اعطيت لهم نصائح بعمل تمارين لعضلات الفك، المجموعة الثانية (22 مريض) وصف لهم علاج مضاد الالتهابات الغير ستيرويدية مع دواء مرخي العضلات. المجموعتان تم تقييمهم سريريا بفحص المفصل الصدغي وعضلات الفك من ناحية وجود الالم و التشنج العضلي وقياس مسافة فتحة الفم ووجود قفل في مفصل الفك. وذلك قبل البدء بالعلاج وبعد العلاج على مدى ثلاث زيارات. **النتائج:** سريريا، لم تظهر النتائج اي من المجموعتين هي الافضل عدا في حالة قفل الفك تغلبت المجموعة الاولى على الثانية. احصائيا لا يوجد اختلافات معنوية بين المجموعتين بعد اكمال الزيارات. **الاستنتاجات:** بالرغم من عدم اظهار فعالية واضحة لهاتين الطريقتين بالعلاج لهؤلاء المرضى في مدة قصيرة، فان تمارين الفك في حال قفل الفك قد تكون مفيدة اكثر من العلاجات الدوائية.

DOI: [10.33899/rdenj.2023.134254.1163](https://doi.org/10.33899/rdenj.2023.134254.1163) , © 2023, College of Dentistry, University of Mosul.

This is an open access article under the CC BY 4.0 license (<http://creativecommons.org/licenses/by/4.0/>)

## INTRODUCTION

Temporomandibular joint disorders (TMJDs) consist of a group of pathologies affecting the masticatory muscles, the temporomandibular joint (TMJ), and related structures (1,2). The main symptoms are pain and limitation of mouth opening. Sound in TMJ area (clicking or crepitus) is the most frequent sign, it produced by joint remodeling and hypermobility (1-3).

The initial management of TMJDs is conservative and reversible, it goals to decrease jaw pain and improve muscles motion (3-5). Several therapeutic protocols have been suggested (2,3,6). Physiotherapy therapy is the most commonly used treatment (5,6-8), and exercises are a common form of physiotherapy treatment in primary care for patients (6, 9-14). Most of systematic reviews highlighted the effects of exercises in improving symptoms and function for patients with TMJDs (4,5,8,14). The exercise programs increase the range of muscles motion, improve coordination of jaw movements and relax tense muscles. Also, exercises have shown to reduce TMJDs pain and increase functional capacity in those patients (6, 9-12). Another advantage is favorable -low cost - benefit ratio over other modalities of treatment (9). Furthermore, it is safe and simple to perform (3,6). However, jaw exercises are usually prescribed in conjunction with other treatment modalities such as psychological; pharmacological

and physiotherapy (2, 4, 6) or may be the sole treatment in patients with initial TMJDs (4, 6, 10,13).

Other conservative therapies for TMJDs are medication which included such classes of agents. For patients with joint disorder and painful muscles, non-steroidal anti-inflammatories analgesia should be prescribed. When muscle tension is present, a muscle relaxant must be provided (3,6,15-17). They are effective in reducing pain at the beginning of treatment. These medications must be taken by patients who evolve into a chronic musculoskeletal pain disorder for a long-term. However, because of their adverse effects, short-term or intermittently are used (2,15).

The “National Institutes of Health Technology Assessment Conference Statement” concluded that physical therapy needs to be scientifically evaluated, as do alternative medicine modalities (3). To our knowledge, the clinical trials involving patients with TMJDs and comparing the exercise method with medication have not been reported in the literatures. Except studies comparing medication combined with other treatment modalities versus exercise.

This clinical study intended to suggest treatment guidelines for TMJDs, by evaluating the effectiveness of exercise therapy in patients with temporomandibular joint disorder and comparing them with patients who take medications.

## MATERIALS AND METHODS

A randomized clinical study was tried and the samples were recruited from Oral Diagnosis and Oral Medicine Department at Al-Noor Specialized Dental Center in Mosul city- Iraq. Period from September 2018 to end of March 2019. A comparative study was conducted after having an approval of the research protocol by the Research Scientific Committee in Nineveh Health Directorate, Ministry of Health.

All patients presenting with TMJDs complaints were recorded - except those refused study participation-. The sample size was 44 patients. After testing the inclusions and exclusions criteria, the included patients were randomized into two groups consecutively. The exercise group (n=22), patients were given instructions a standard program of active and passive jaw exercises according to Carlsson and Magnusson instructions (6), three times a day over a period of 10-14 days, each exercise was done 20 times for each session.

The second group was the medication group (n=22), patients were given non-steroidal anti-inflammatory drug (7.5 mg of meloxicam) and skeletal muscle relaxant; orphenadrine 35 mg plus acetaminophen 450 mg (myogestic) every 12 hours. Patients of both groups were requested to refrain from the use of any medicaments throughout the trial. Informed consent was obtained from all participants. the acceptance for the participation patients younger than 18 was taken from and

consent signed by one of the parents. Wherever all patients were informed about the nature of the clinical trial and they had the right to participate or refuse without affecting their treatment, each patient had the information about the procedure and the method of treatment and he could not continue the drug or physical therapy at any stage of the procedures. The patient instructed to stop the exercises if the exercise is accentuating the pain.

Inclusion criteria were as follows:

- (1) Male and female were included.
- (2) Patients  $\geq 14$  years of age.
- (3) Diagnosis of TMJDs according to the research diagnostic criteria for temporomandibular disorders (RDC/TMJ) (1).
- (4) Has pain and/or muscle spasm impairment.

Exclusion criteria were:

- (1) Patients doesn't have history of musculoskeletal dysfunction,
- (2) No previous surgery in the temporomandibular region,
- (3) No other serious comorbid conditions such as fracture in region, cancer, and neurological diseases.

Case selection, diagnosis and examination was carried out by two examiners in the same time, one examiner was prescribed the medications and gave instructions for the exercises.

A study case sheet was completed for each patient before treatment. Health history including past and present medications. To accomplish the examination of the clinical TMJDs, a criteria was calculated (yes or no), presence of TMJ pain; hearing of clicking -without

using stethoscope-; presence of muscles spasm (by right and left palpation of temporalis, lateral pterygoid, masseter, and Sternocleidomastoid muscles); maximum mouth opening (with and without assistant) measured by ruler (in millimeters);

measurement of lateral interincisal distance (in millimeter); presence of mouth deviation and TMJ locked presence. The data were recorded in table (table 1), all three visits, between each visit 5-7 days.

**Table 1:** Recorded data of the patients in each visit (V).

Criteria	Right			Left		
	V0	V1	V2	V0	V1	V2
Temporalis						
Lateral pterigoid						
Masseter						
sternocleidomastoid						
TMJ pain						
TMJ sound						
	V0	V1	V2			
Maximum assistant opening ( mm)						
Maximum unassistant opening. ( mm)						
Lateral interincisal distance (mm)						
Deviation						
Locked						

Data were translated into a computerized database structure. Statistical analysis was computer assisted using SPSS (Statistical Package for Social Sciences) version 25 for Windows. The statistical difference between the two groups was assessed by the Mann-Whitny U test. Statistical significance was accepted for values of as  $p < 0.05$ .

**RESULTS**

Out of the 44 patients eligible for inclusion in the study. The patients were randomized into

two groups, there were 22 in exercise treatment group (5 males, 17 females), their age range was 14-50 years with the mean age  $\pm$  SD was  $29.5 \pm 8.9$ . In second group, patients treated by medications, were 22 (8 males, 14 females) age ranges 15-50 years, mean age  $\pm$  SD was  $26.8 \pm 7.9$ . Not all patients committed their three visits, and they were break off their treatment. No adverse effects occurred during the treatment. The number of patients' visits for each group is shown in table 2.

**Table 2:** Patients' number in each visit for each group

Visits Groups	Visit 0 (Baseline)	Visits 1	Visits 2
Exercise group	22	10	4
Medication group	22	11	5
Total	44	21	9

In the comparison of the two groups, the exercise group and medication group showed that no significant differences in variance after two

visits. Only in the lateral incisal distance, there was statistically significant difference between two groups in base line visit and visit 1, (table 3).

**Table 3:** The statistical differences of treatment between the two study groups in each visits.

<b>Muscles and joints criteria</b>	<b>Visit (V) no.</b>	<b>side</b>	<b>Mann-Whitny U test</b>	<b>Asymp. Significance.*</b>
<b>Temporalis muscle spasm</b>	V 0	Right	0.118	0.731 [NS]
		Left	0.000	1.000 [NS]
	V 1	Right	0.384	0.535 [NS]
		Left	1.455	0.228 [NS]
	V 2	Right	0.029	0.866 [NS]
		Left	0.080	0.777 [NS]
<b>Lateral pterygoid muscle spasm</b>	V 0	Right	0.091	0.764 [NS]
		Left	0.368	0.544 [NS]
	V 1	Right	1.455	0.228 [NS]
		Left	1.117	0.290 [NS]
	V 2	Right	0.800	0.371 [NS]
		Left	0.980	0.322 [NS]
<b>Masseter muscle spasm</b>	V 0	Right	0.099	0.753 [NS]
		Left	0.091	0.764 [NS]
	V 1	Right	0.145	0.703 [NS]
		Left	1.227	0.268 [NS]
	V 2	Right	0.094	0.759 [NS]
		Left	1.500	0.221 [NS]
<b>Sternocleidomastoid muscle spasm</b>	V 0	Right	0.007	0.934 [NS]
		Left	0.182	0.670 [NS]
	V 1	Right	0.527	0.468 [NS]
		Left	0.467	0.495 [NS]
	V 2	Right	0.800	0.371 [NS]
		Left	1.829	0.176 [NS]
<b>TMJ pain</b>	V 0	Right	0.815	0.367 [NS]
		Left	0.448	0.503 [NS]
	V 1	Right	0.018	0.893 [NS]
		Left	0.061	0.806 [NS]
	V 2	Right	0.029	0.866 [NS]
		Left	0.980	0.322 [NS]
<b>TMJ sound</b>	V 0	Right	1.792	0.181 [NS]
		Left	0.091	0.764 [NS]
	V 1	Right	0.145	0.703 [NS]
		Left	2.627	0.105 [NS]
	V 2	Right	0.200	0.655 [NS]
		Left	0.800	0.371 [NS]
<b>Maximum assistant opening</b>	V 0		0.007	0.934 [NS]
	V 1		0.179	0.672 [NS]
	V 2		2.178	0.140 [NS]
<b>Maximum unassistant opening</b>	V 0		0.374	0.541 [NS]
	V 1		1.933	0.164 [NS]
	V 2		0.242	0.623 [NS]
<b>Lateral inter incisal distance</b>	V 0		4.132	0.042 [S]
	V 1		5.073	0.024 [S]
	V 2		2.254	0.133 [NS]
<b>Deviation</b>	V 0		0.843	0.359 [NS]
	V 1		0.091	0.763 [NS]
	V 2		0.980	0.322 [NS]
<b>Locked</b>	V 0		0.000	1.000 [NS]
	V 1		0.273	0.602 [NS]
	V 2		0.800	0.371 [NS]

\* Non significance [NS] when value of  $p > 0.05$ .

## DISCUSSION

This study, like several others (7, 10, 11, 17) did not include a placebo or a control group, hence the observations may simply have been the results of time in both groups.

Self-exercises like resistant mouth opening can be used in a more idiosyncratic manner to manage the TMJDs pain, and any unique therapeutic effects beyond the basic muscle stretch have not been established (2,18). In this study, the clinical results showed that patients with locked jaw experienced such benefit from exercises more than patients with medication group. This agrees with Yoshida et al who suggested that exercises of the mandibular condyle are efficient initial treatment for patients with closed lock TMJDs (18).

In the medication group, patients administrated meloxicam - which is a non-steroidal anti-inflammatory drug that exhibits anti-inflammatory and analgesic effects- combined with skeletal muscle relaxant (2, 3, 6, 16). Drug therapies of chronic pain of TMJDs are complex and require knowledge and experience (2, 15). A short trial was used in this study to avoid the incidence of gastrointestinal tract side effect and kidneys toxicity after long-term administration of non-steroidal anti-inflammatory drug (15, 16). In review of pharmacological interventional studies, most of pharmacological agents used to manage TMJDs have not completed any standardized assessment of efficacy (15).

The main finding of this study when comparing the effectiveness of exercises in TMJDs patients with those who took medication was that no statistically significant difference in any of the outcome variables seen between the two groups within 14 days follow-up of treatment. Moreover, like this study, many researches showed that exercises did not have clear superiority over other conservative treatments for TMJDs (5, 14, 17).

A short term follow up perhaps obliterate differences. Furthermore, less than 50% of the patients rated the expectations as totally or partly fulfilled. In addition to that, various interventions and events occurring during the follow-up period may have an impact that is beyond the control of the researchers and can therefore interfere with the follow up results. The overall level of other studies evidences in TMJ exercises is low, and because of the shortcomings their effectiveness has not been proven (7, 14, 18). It is hard to make comparisons between the outcomes and difficult to draw any conclusions about the impact of a guide line treatment on TMJDs in particular (4, 5, 14, 19). However, other randomized trials have shown that exercises have a positive effect on TMJDs (10, 12, 13, 18). So that, the existence of multiple clinical trials for TMJDs is commendable.

In conclusion, in spite of lacking a definite evidence of treatment efficacy in patients with TMJDs between two groups, exercises of the masticatory muscles are as

effective treatment for locked jaw in short time trial more than medical agents did.

In the near future it will be necessary to make a more detailed study of the long term benefits of jaw exercise. High-quality evidence about TMJDs treatment is recommended for creation of the clinical guidelines.

**Conflict of interest:** Non

### REFERENCES

1. Manfredini D, Guarda-Nardini L, Winocur E, Piccotti F, Ahlberg J, Lobbezoo F. Research diagnostic criteria for temporomandibular disorder: a systematic review of axis I epidemiologic findings. *Oral Surg Oral Med Oral Path Oral Radiol Endod.* 2011; xx:xxx.
2. Ohrbach R, Sollecito T, Omolehinwa T, Greenberg M S. Temporomandibular disorder. Chapter 10. In Glick M, Greenberg MS, Lockhart PB, Challacombe SJ editors. *Burket's Oral Medicine*, 13th edition. Wiley Blackwell Shelton, India. 2021: P: 349-418.
3. National Institutes of Health Technology Assessment Conference Statement. *Management of Temporomandibular Disorders*, 1996.
4. Medlicott MS, Harris SR. A systematic review of the effectiveness of exercise, manual therapy, electrotherapy, relaxation training, and biofeedback in the management of temporomandibular disorder. *Phys Ther.* 2006; 86:955–973.
5. McNeely M L, Olivo S A, Magee D J. A systematic review of the effectiveness of physical therapy interventions for temporomandibular disorders. *Phys Ther j.* 2006; 86(5): 710-25.
6. Carlsson G E and Magnusson T. Treatment modalities, Chapter 11. In *Management of temporomandibular disorder in the dental general practice*. Quintessence Books, Germany. 1999. P: 93-122.
7. Rashid A, Matthews NS, Cowgill H. Physiotherapy in the management of disorders of the temporomandibular joint perceived effectiveness and access to services: a national United Kingdom survey. *Br J Oral Maxillofac Surg.* 2013; 51:52–57
8. Brantingham JW, Cassa TK, Bonnefin D, Pribicevic M, Robb A, Pollard H et al. Manipulative and multimodal therapy for upper extremity and temporomandibular disorders: a systematic review. *J Manipulative Physiol Ther.* 2013; 36:143–201.
9. A, Wijer A. DE, Steenks M, Farella M. Home-exercise regimes for the management of non-specific temporomandibular disorders. *Journal of oral rehabilitation.* 2005; 32 (11): 779-85.
10. Häggman-Henrikson B, Wiesinger B B, Wänman A. The effect of supervised exercise on localized TMD pain and TMD pain associated with generalized pain. *Acta Odontologica Scandinavica* 2018; 76.1: 6-12.
11. Nicolakis P, Erdogmus B, Kopf A, Ebenbichler G, Kollmitzer J, Piehslinger E, Fialka-Moser V. Effectiveness of exercise therapy in patients with internal derangement of the temporomandibular

- joint. *J Oral Rehabilitation*. 2001 Dec; 28(12):1158-164.
12. Bae Y, Park Y. The Effect of Relaxation Exercises for the Masticator Muscles on Temporomandibular Joint Dysfunction (TMD). *J Phys Ther Sci*. 2013 May; 25(5): 583–86.
13. Moleirinho-Alves P, Benzinho T, Paço M. Effects of therapeutic exercise in TMDs with pain. *Annals of Medicine J*. 2019; 51 (1): S225.
14. Armijo-Olivo S, Pitance L, Singh V, Neto F, Thie N, Michelotti A. Effectiveness of Manual Therapy and Therapeutic Exercise for Temporomandibular Disorders: Systematic Review and Meta-Analysis. *Phys Ther*. 2016 Jan; 96(1): 9–25.
15. Dionne RA. Pharmacologic treatments for temporomandibular disorders. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1997; 83:134–42.
16. British National Formulary (BNF) 79. Chapter 10. BMA and the Royal Pharmaceutical Society of Great Britain. London, UK. ; March- September 2020. P: 1127-193.
17. Schiffman EL, Look JO, Hodges JS, Swift JQ, Decker KL, Hathaway KM et al. Randomized Effectiveness Study of Four Therapeutic Strategies for TMJ Closed Lock. *J Dent Res* 2007; 86(1):58-63.
18. Yoshida H, Sakata T, Hayashi T, Shirao K, Oshiro N, Morita S. Evaluation of mandibular condylar movement exercise for patients with internal derangement of the temporomandibular joint on initial presentation. *British Journal of Oral and Maxillofacial Surgery* 2011; 49: 310–13.
19. Yuasa H, Kino K, Kubota E , Kakudo K, Sugisaki M , Nishiyama A et al. Primary treatment of temporomandibular disorders: The Japanese Society for the temporomandibular joint evidence-based clinical practice guidelines, 2nd edition. *Japanese Dental Science Review* 2013; 49: 89—98.