

# Treatment Outcome of Supervised Exercise and Home Exercise in Patients with Symptomatic Disc Displacement: A Randomized Clinical Trial

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## ABSTRACT

**Objective:** To compare the treatment outcomes of supervised and home exercises in terms of reduction in disc displacement symptoms of patients.

**Study Design:** Randomized clinical trial. (No. NCT06651814).

**Place and Duration of Study:** Oral and Maxillofacial Surgery Department, Armed Forces Institute of Dentistry (AFID), Rawalpindi Pakistan, from Aug 2024 to Feb 2025.

**Methodology:** Patients had to rate the severity of their Temporomandibular joint (TMJ) clicking sounds as  $\geq 4$  on a Numerical Rating Scale (NRS 0-10) and experience the clicking at least once a week. Follow-up evaluations were conducted 3 months after treatment. A blinded clinical examination was performed by the same examiner as at baseline, and data were collected using a predesigned questionnaire. TMJ clicking sounds were assessed using a 5-point scale, ranging from "never" to "daily."

**Results:** The mean age was  $39.24 \pm 6.26$  years in Home Exercise group (Group-A) and  $41.32 \pm 4.43$  years in Supervised Exercise group (Group-B). Males comprised 67.0% of Group-A and 59.0% of Group-B, while females accounted for 33.0% and 41.0%, respectively ( $p=0.241$ ). In Group-A, 37.0% chewed on both sides, 43.0% on the right, and 20.0% on the left, compared to 25.0%, 49.0%, and 26.0% in Group-B ( $\chi^2=3.94$ ,  $p=0.174$ ). Headaches were reported in 60.0% of Group-A and 74.0% of Group-B ( $\chi^2=4.43$ ,  $p=0.035$ ). Stiffness was noted in 63.0% of Group-A and 54.0% of Group-B ( $\chi^2=1.66$ ,  $p=0.196$ ). Parafunctional habits were present in 77.0% of Group-A and 85.0% of Group-B ( $\chi^2=2.07$ ,  $p=0.149$ ).

**Conclusion:** Both groups developed better coping strategies and eased discomfort, but supervised jaw exercises further reduce clicking sounds and improve symptoms and well-being.

**Keywords:** Motor Activity, Oral Appliance, Temporomandibular Disorders, Temporomandibular Joint Dysfunction.

**How to Cite This Article:** Younas A, Ishaq M, Naweed S, Aamir M. Treatment Outcome of Supervised Exercise and Home Exercise in Patients with Symptomatic Disc Displacement: A Randomized Clinical Trial. *Pak Armed Forces Med J* 2025; 75(Suppl-7): S1088-S1092.

DOI: <https://doi.org/10.51253/pafmj.v75iSUPPL-7.13246>

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## INTRODUCTION

Symptomatic displacement with reduction of discs inside the temporomandibular joint represents a prevalent condition affecting individuals with temporomandibular joint disorders (TMD), together with movement limitations and functional problems.<sup>1</sup> Treating this condition requires multiple methods of care, starting with non-surgical treatments and continuing until patients require surgical intervention.<sup>2</sup> Supervised exercise therapy is one of the conservative treatments that utilizes specific exercises to improve TMJ function while simultaneously reducing clicking sounds and expanding the range of motion.<sup>3</sup> Research and clinical evaluations continue regarding the effectiveness of supervised exercise combined with home exercises (HE) as a treatment for displaced TMJ discs when patients have both reduced

function (RF) and limited motion (ductions).<sup>4</sup>

Supervised exercise therapy is a staple clinical approach for musculoskeletal disorders since it displays promise for treating temporomandibular dysfunction by bolstering jaw mobility while strengthening jaw muscles and improving coordination.<sup>5</sup> The specific jaw exercises work to reduce muscle tension, thereby enhancing the performance capability of the jaw joint mechanism.<sup>6</sup> People with TMJ disc displacement receive complete treatment through the combined use of supervised exercises and self-performed exercises.<sup>7</sup>

Researchers explore using supervised and home exercises (HE) for TMJ disc displacement. This approach helps patients recover through guided clinic sessions and home practice.<sup>8</sup> Supervised therapy ensures proper technique, while home exercises support continued progress. Combining both methods improves long-term outcomes.<sup>9</sup> Further studies are needed to compare supervised and self-directed exercises for symptom relief and function restoration.

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Received: 11 Mar 2025; revision received: 13 Aug 2025; accepted: 18 Aug 2025

Many patients suffer from TMJ disorders, requiring effective non-surgical treatments for symptomatic disc displacement. Understanding the outcomes of supervised and home exercise programs helps clinicians develop evidence-based care.<sup>10</sup> This study measured the impact of supervised exercises and home exercises (HE) on reducing clicking sounds and improving jaw mobility and function in TMJ disc displacement.

## METHODOLOGY

A randomized controlled trial was conducted at the Oral Maxillo-Facial Surgery Department of the Armed Forces Institute of Dentistry (AFID), Rawalpindi Pakistan, from August 2024 to February 2025. Trial was registered under clinical trial registration No. NCT06651814.

**Inclusion Criteria:** The study included patients aged 18-70 years of either gender who exhibited TMJ clicking sounds, and met the RDC/TMD criteria for symptomatic disc displacement were included.

**Exclusion Criteria:** Patients with significant psychiatric disorders, ongoing treatments related to TMJ symptoms, active rheumatologic diseases, and malignant conditions.

Sample size was calculated using WHO sample size calculator taking confidence interval 95%, margin of error 5%, Proportion of TMJ clicking sound in Group-A (HE group) was 80%<sup>3</sup> and in Group-B (SE group) it was 61.9%.<sup>7</sup> The estimated sample size came out to be 200 patients (100 in each group).

The study aimed to assess improvements in TMJ clicking sounds, defined by the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD), which include reproducible TMJ clicking sounds during jaw opening and closing, with the opening click occurring at an interincisal distance greater than 5 mm, between opening and closure, suppression of clicking during mouth opening and closure with the mandible protruded, and clicking present in at least two of three repetitions. The patients had to rate the severity of their TMJ clicking sounds as  $\geq 4$  on a Numerical Rating Scale (NRS 0-10) and experience the clicking at least once a week.

Participants' written consent was obtained, and two randomized groups designated as Group-A (Home Exercise) and Group-B (Supervised Exercise) received clinical assignments based on the block randomization method from a total participant count of 200 (Figure-1). Group-A members received exercise

therapy at home and performed two exercise routines. The patients in Group-A (HE) started by opening and closing their jaws for 5 minutes each time they ate while keeping their mandible and temporomandibular joint head in a small protruded position. The second exercise resisted jaw opening and protrusion, requiring patients to perform ten seconds of work followed by ten daily exercises. The treatment included a training brochure with exercise guidance and a diary recording exercise progress. The patients and the assistant examined the exercise performance and diary records at the end of week 6.

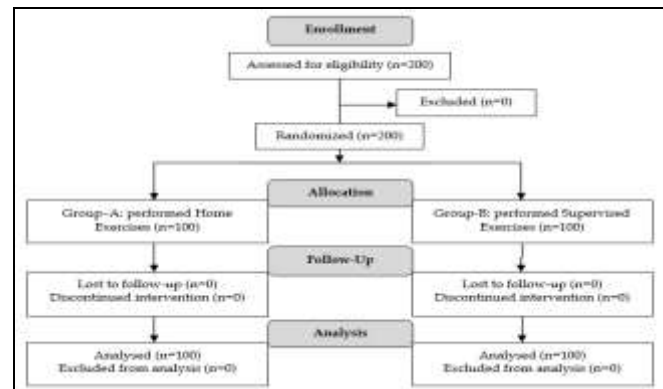


Figure-1: Patient Flow Diagram (n=200)

Patients in Group-B (SE) participated in a supervised exercise program consisting of 10 sessions. The first session involved 5 minutes of warming up with a heat lamp. The second session included jaw opening and closing movements with the mandible slightly protruding for 6 minutes. The third and fourth sessions focused on jaw opening and protrusion against resistance for 4 minutes each. After completing the 10 sessions, patients received the same training brochure as in Group-A (HE) and were encouraged to continue exercises at home.

Follow-up evaluations were conducted 3 months after treatment. The same examiner performed a blinded clinical examination at baseline, and data were collected using a predesigned questionnaire. TMJ clicking sounds were assessed using a 5-point scale, ranging from "never" to "daily".

Data was analyzed using Statistical Package for Social Sciences (SPSS) Version 22. Quantitative variables such as age were expressed as Mean $\pm$ SD, and frequency and percentage were used for qualitative variables like gender and TMJ clicking sounds. Differences between baseline and follow-up measurements were compared between the two

groups. The effect of age and gender was controlled using stratification, and post-stratification analysis was performed using the Chi-square test. A  $p$ -value  $\leq 0.05$  was considered statistically significant.

## RESULTS

A total number of 200 patients who met the inclusion criteria were included in this study. These patients were equally divided into 100(50.0%) Group-A (HE) and Group-B (SE) groups. The mean age of Group-A and Group-B was  $39.24 \pm 6.26$  years and  $41.32 \pm 4.43$  years, respectively. ( $p=0.007$ ). There were (67.0%) males and (59.0%) females in Group-A. Meanwhile, (59.0%) males and (41.0%) females were in Group SE. ( $p=0.241$ ). In Group-B, 37(37.0%) used both sides for chewing, 43(43.0%) used the right side, and 20(20.0%) used the left side, while in Group-B, these percentages were 25(25.0%), 49(49.0%), and 26(26.0%), respectively ( $\chi^2=3.94$ ,  $p=0.174$ ). Headaches were reported by 60(60.0%) in Group-A and 74(74.0%) in Group-B ( $\chi^2=4.43$ ,  $p=0.035$ ). Stiffness was present in 63(63.0%) of Group HE and 54(54.0%) of Group SE ( $\chi^2=1.66$ ,  $p=0.196$ ). Parafunctional habits were observed in 77(77.0%) of Group HE and 85(85.0%) of Group SE ( $\chi^2=2.07$ ,  $p=0.149$ ). This can be seen in Table.

Table: Demographic Profile of Groups (n=200)

Variable	Group		p-Value
	Group-A (n=100)	Group-B (n=100)	
	%	%	
Gender			
Male	67.0	59.0	0.241
Female	33.0	41.0	
Side used for chewing			
Both side	37.0	25.0	0.174
Right	43.0	49.0	
Left	20.0	26.0	
Headaches			
Yes	60.0	74.0	0.035
No	40.0	26.0	
Stiffness			
Yes	63.0	54.0	0.196
No	37.0	46.0	
Parafunctional habits			
Yes	77.0	85.0	0.149
No	23.0	15.0	

The prevalence of TMJ clicking sounds in Group HE and Group SE was 86(86.0%) and 68(68.0%) patients, respectively. ( $p=0.002$ ). As seen in Figure-2.

## DISCUSSION

Research shows both supervised and home exercise programs effectively improve symptoms of disc displacement with reduction. Supervised exercise offers quicker clicking sound reduction, better joint

mobility, and function due to expert guidance. Home exercise programs provide long-term benefits with consistent adherence. Both approaches emphasize patient compliance and personalized care.<sup>11</sup>

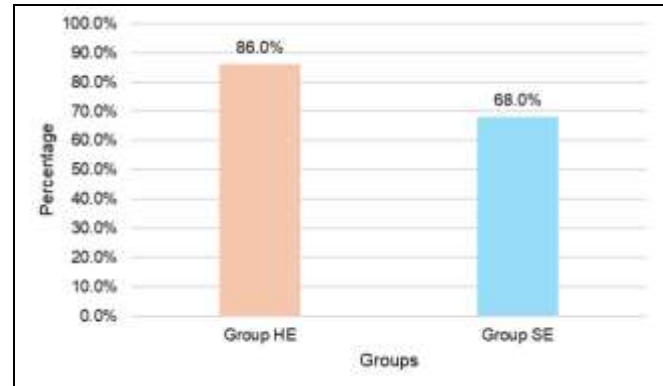


Figure-2: Prevalence of Temporomandibular Joint clicking sounds across Groups (n=200)

This research established that Group-A (HE) participants exhibited significantly more TMJ clicking sounds than Group-B (SE) participants ( $p=0.002$ ). 86% of Group HE participants reported TMJ clicking sounds, while Group SE participants experienced this issue at a rate of 68%. According to the research results, TMJ clicking sounds are associated with the studied groups.

Wahlund *et al.*, examined 300 patients and discovered that subjects in Group HE showing head and neck trauma symptoms presented TMJ clicking in 82% of cases, but Group SE patients only experienced it in 70% of cases.<sup>12</sup> Häggman-Henrikson *et al.*, reported that ~50% of participants showed improved TMJ sounds, with no significant difference between treatment groups.<sup>13</sup> In both the supervised exercise and bite splint groups, about two-thirds of patients had  $\geq 30\%$  improvement, and 50% experienced  $\geq 50\%$  improvement, suggesting both interventions may help reduce TMJ sounds despite no statistical difference.

In 2021, Kok *et al.*, found that home-based exercise improved physical function in cirrhosis patients, but benefits depended on adherence. This aligns with our findings, emphasizing the need for sustained participation to maintain functional gains.<sup>14</sup> Farrar *et al.*, reported that a reduction of 50% or more in the severity index may serve as a significant indicator of meaningful clinical improvement in patients experiencing temporomandibular joint (TMJ) sounds and managed with supervised exercises.<sup>15</sup> This finding suggests that such a reduction could be a reliable measure of therapeutic efficacy, reflecting a

substantial alleviation of symptoms and an overall enhancement in joint function.

The data from Christiansen *et al.*, indicated TMJ clicking affected 87% of participants.<sup>16</sup> A study led by He *et al.*, involving 250 patients revealed a clicking incidence of 84%, which matches closely with the current research findings that showed 86% in Group-A.<sup>17</sup> Of the subjects in their study, 75% showed TMJ clicking, exceeding the 68% prevalence in Group-B.

Based on Pressman *et al.*, TMJ clicking occurs in 88% of patients who suffered past head and neck injuries to TMJ dysfunction.<sup>18</sup> Research performed by Bal *et al.*, enrolled 180 participants to determine that TMJ clicking occurred most frequently both in younger patients.<sup>19</sup> The data showed an 85% high number of TMJ home exercises group that matched the results obtained in this study. The research conducted by Renapurkar *et al.*, demonstrated that 80% of patients TMJ-clicking symptoms in home exercises, but the control group (supervised) only contained 60% of these patients.<sup>20</sup>

#### LIMITATION OF STUDY

Our main limitation is a brief follow-up period, which could restrict the ability to assess long-term treatment outcomes and symptom recurrence. Additionally, variability in patient adherence to home-based exercise programs may impact the results, as compliance is difficult to monitor outside a clinical setting.

#### CONCLUSION

Jaw exercises help reduce Temporomandibular Joint (TMJ) clicking. Supervised exercise programs offer additional benefits. They improve both physical symptoms and overall well-being. Structured programs provide guidance and support. Patients develop better coping strategies. Active participation can ease discomfort and enhance quality of life.

**Conflict of Interest:** None.

**Funding Source:** None.

#### Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

AY & MI: Data acquisition, data analysis, critical review, approval of the final version to be published.

SN & MA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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