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### Dry needling followed by 4 weeks of cranial stabilization exercise on health-related quality of life in patients with temporomandibular disorders: An experimental study

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#### Abstract

**Aim:** To explore the effectiveness of physical therapy approach on quality of life in patients with temporomandibular disorder (TMD). **Materials and Methods:** This was an experimental study with a randomized control trial design. We recruited 90 subjects with both the gender, aged between 18 and 50 years who were clinically diagnosed with TMD. They were randomly divided through the lottery method into two groups: the control group and the experimental group. For outcome measurement, a short form of health-related questionnaire (SF-36) was used to assess the quality of life. In this study, the control group received normal home-based exercise, and the experimental group received physical therapy approach, consisting of dry needling and muscular inhibition combined with home-based exercise. Statistical analysis was carried out using a Student's *t* test and using the Statistical Package for the Social Sciences (SPSS) software program, version 16.0. **Results:** The experimental group who performed dry needling and 4 weeks of exercises was shown significantly higher scores in all the domains of the questionnaire ( $P < 0.05$ ). In the control group, conventional physiotherapy was applied, and improvement was shown only in the pain domain but not in the other parameters in comparison with the experimental group. The level significant level was considered as  $P < 0.05$  for the analysis of data. **Conclusion:** The results of this study claimed that the application of a physiotherapy protocol in association with dry needling was able to improve health-related quality of life in patients with TMDs.

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## Full Text

### Introduction

Temporomandibular disorders (TMDs) have turned into one of the most common problems among physical therapists and dentists.[1] TMD is a cervical-cranio-mandibular dysfunction that affects both the temporomandibular joint and the central nervous system.[2] The etiology of this condition is related to biomechanical, neuromuscular, and biopsychosocial factors, and the condition can aggravate with emotional stress, bad posture, the malocclusion, tooth loss, as well as various external and intrinsic changes in the structural components of the temporomandibular joint.[2],[3],[4]

The main signs symptoms of patients with TMD include pain in temporomandibular joint and muscle with or without reduced jaw mobility.[5],[6] Multifactorial etiology in TMD often requires a multidisciplinary approach to dealing with severe symptoms, including chronic pain.[7] Current evidence suggested that various conservative approaches such as massage, exercise, dry needling, electrotherapy, pharmacology, and manipulation are effective against TMD-related symptoms. [8],[9]

The treatment approach comprised in the therapeutic approach of this model is to a reduction in pain perception and improvement of motor behavior and improvement of cognitive and emotional factors related to the experience of pain.[10] To reduce pain intensity, most authors suggested that dry needling is one of the popular methods of a multidisciplinary approach to reduce pain.[11],[12] Exercise programs were aimed to achieve in the improvement of motor performance, improvement of cognitive and emotional factors related to the experience of pain. However, to the best of our knowledge, there is still no research that proves the effectiveness of dry needling in combination with cranial stabilization exercise on health-related quality of life in patients with TMD. Therefore, the aim of this study was to evaluate the effectiveness of a multimodal physiotherapy approach to health-related quality of life in patients with TMD.

### Materials and Methods

## Sampling method and size calculation

This randomized control trial was conducted from June 2019 to March 2020. The data for the study were obtained from the outpatient department (OPD), Department of Physiotherapy, Lovely Professional University campus in Punjab. The sampling method was randomized convenience sampling. The sample size was calculated based on a 95% confidence interval, 80% power of the study, and 0.4 Cohen (d effect size). The calculated sample size was 36 per group. Due to dropout chances, we included 45 subjects per group.

## Sampling criteria

After a preliminary assessment, they were randomly divided into two groups by using the lottery method, namely the control group and experimental group. The participants were included for the study, pain, and positive three-finger test with limited maximum mouth opening of less than 30 mm (but not necessarily painful) originating in the temporomandibular joint. Those who are suffering any dental problem, headache, hypertension, diabetes, asthma, epilepsy, and trauma and surgery to the maxillofacial area were excluded from the study. The control group received conventional physiotherapy with the normal home-based exercise, and the experimental group received a physical therapy approach made of dry needling and home-based exercise.

## Outcome measure

A short form of the health-related questionnaire (SF-36) was used to evaluate the quality of life.[13] The data were collected before starting the intervention and after 4 weeks of the treatment protocol. SF-36 is a general tool that consists of 36 questions and is divided into eight areas (functional capacity, physical limitations, pain, general health, vitality, social aspect, emotional aspect, and mental health). It represents the basic human values associated with evaluating the quality of life of the general population.

## Intervention

Total duration of the intervention was 4 weeks. The dry needling and exercises were performed in the experimental group consisted of three sessions per week. The dry needling technique was performed on masseter, temporalis, and suboccipital muscle, and the exercises include deep neck flexor activation, cervical spine bracing exercise, and shoulder stabilization exercise.[14] Before using the dry needling, the skin surfaces were cleaned by saline water, the plastic guided 40 mm acupuncture needle was inserted into the tender point of the muscle. In the third and fourth weeks, supervised exercise was performed. The conventional physiotherapy treatment received by the control group was performed twice a week for a total of eight sessions for 4 weeks with a duration of 10 min of the normal range of motion exercise of the cervical and TMD joint.

## Data analysis

A summary of the study protocol is shown in [Figure 1]. Kolmogorov–Smirnov test was used to identify the normal distribution of the data. Baseline, a characteristic of categorical variables, was evaluated through measured through chi-square test, a quantitative variable was evaluated through Student's t test, and a quantitative variable without normal distribution was measured through a Mann–Whitney U test. The intra- and intragroup outcome measures were evaluated through pair t test. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software program, version 16.0 (IBM Corporation, NY, USA). The level of significance for this study was fixed at 5% ( $P < 0.05$ ).{Figure 1}

## Results

We recruited 90 subjects with both the gender, aged between 18 and 50 years who were randomly allocated into two groups: 45 subjects to control group and 45 subjects to experimental group. In control group 3 subjects were not received the treatment and in experimental group 2 subject were discontinued their treatment due to their personal issue and non-adherence to the treatment. Finally, 85 subjects (55 women and 30 men) were included in final analysis. No adverse effects were observed as a result of treatment approach in experimental group. In the descriptive demographic data, no significant difference was found [Table 1]. There was a significant change in the experimental group for all the parameters of quality of life after the intervention [Table 2]; in the control group, significant changes were not found except the pain domain [Table 3]. In control group, comparison of pre and post outcome measure of health-related quality of life revealed no statistically significant change except pain domain where physical functioning ( $P > .05$ ), role of limitation physical health ( $P > .05$ ), role of limitation emotional health ( $P > .05$ ), energy ( $P > .05$ ) emotional well-being ( $P > .05$ ), social life ( $P < .05$ ), body pain ( $P > .05$ ), and general health ( $P < .05$ ). In experimental group, comparison of pre- and post-outcome measure of health-related quality of life revealed statistically significant change ( $P < .05$ ).{Table 1} {Table 2} {Table 3}

When the posttreatment data were compared between the groups, it was found that the experimental group parameters were significantly different than the control group ( $P < .05$ ).

## Discussion

The main objective of this study was to evaluate the effectiveness of exercise together with dry needling to improve the quality of life in patients with TMD. The results showed a significant improvement in the quality of life in all domains for the experimental group compared with the control group. In the control group, no improvement was shown in health-related the quality of life for all the parameters except the domain of pain. It is because; the study found that therapeutic ultrasound had can affect pain expression.[15] In the comparison of two groups, the improvement shown in physical functioning 29.93 points, the role of limitations due to physical health 53.86 points, role of limitations due to emotional health 50.87 points, energy 33.73 points, emotional well-being 19.13 points, social life 20.58 points, bodily pain 20.70 points, general health 33.17 points [Table 3].

A recent study was conducted by Gil-Martínez et al.[10] and concluded that a multidisciplinary approach is compulsory to treat the patient with TMD. They also suggest that physical modalities only can reduce the symptoms, but promoting a better quality of outcome interdisciplinary approach is required. Felicio et al.[16] did another similar study. In 2008, the SF-36 questionnaire was used and shown that the physical therapy method is capable of improving the quality of life in patients with TMD.

Their study showed that exercise, combined with the physical therapy approach was a positive treatment approach for managing patients with TMD.[17],[18] They conclude that supervised exercise is required for a better prognosis for patients with TMD. In our study, we proposed supervised exercise, and all the exercises

were supervised by 10 years from experienced physical therapists. Exercises include cervical as well as the mandibular area. Because many study proved that there is a direct connection between cervical spine and jaw posture, it can be assumed that, during jaw movement, the neck muscles co-activate[19],[20]; therefore, any pain in the jaw region could be the cause of neck and shoulder muscle weakness.[21]

The intention to add dry needling was that myofascial in the masseter, and suboccipital muscle is widespread in patient with TMD. Dry needling is one of the best option to treat myofascial trigger point.[22] It is observed that TMD management is missing of validated protocols of in physical therapy practice.[15],[23] Moreover, there are few studies with this study showed that there are few studies with a weak methodology found that multidisciplinary approach.[24],[25]

This study was a multidimensional approach where improvement has shown in all the parameters. From this study, it can be concluded that dry needling, combined with exercise, was an effective method to improve the health-related quality of life in subjects with TMD. As there are no adverse effects of this treatment method, and cost-effectiveness is very low, so that it could be used in clinical practice. In future prolonged follow-ups with more outcome measures should be carried out with multidisciplinary intervention like dental, pharmacological, physical therapy, and psychological therapy for gold standard treatment method establishment of patients with TMD.

This is the first study as per our knowledge where the health-related quality of life was evaluated after multimodal physical therapy treatment. The study has some limitations, including the therapy outcome has been evaluated only in terms of a self-reported questionnaires. It is missing an objective evaluation of outcome of the patient. Future studies should examine the objective examination.

#### Conclusion

The study results showed that manual physical therapy in conjunction with dry needling treatment is beneficial for improving patients' quality of life with TMD. It was concluded that the dry needling could be a part of a physical therapy managing protocol for better management of patients with TMD.

#### Future scope and clinical significance

To the best of the authors' knowledge, this is the first study to investigate the effects of dry needling and therapeutic exercise on health-related quality of life in patients with TMD. This study results suggest that dry needling in combination with therapeutic exercise was effective to improve health-related quality of life in patients with TMD. Therefore, the protocol can be used by physical therapy and dental practitioners in their clinical practice to manage health-related quality of life of the patients with TMD as the cost-effective is very low and easy to apply on patient. Nevertheless, further large-scale and long-terms studies with more outcome measures are needed to establish the most effective treatment method

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#### Conflicts of interest

There are no conflicts of interest.

#### Ethical clearance and institutional review board statement

Institutional research and institutional ethical committee approval were obtained before recruiting the patient (LPU/IEC/2019/01/05) for the proposed study, and the clinical trial registration number was CTRI/2019/06/019858. In this study, all human ethical principles were followed in accordance with the guidelines of the World Medical Association's Declaration of Helsinki (2013) and Good Clinical Practice (Indian Medical Research Council).

#### Patient declaration of consent

All participants were informed of the study and consent was signed prior to starting the study.

#### Data availability statement

The data that support the findings of this study are available from the corresponding author (Dr. Ramesh Chandra Patra, e-mail: rameshpatra2208@gmail.com) on reasonable request.

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