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RESEARCH

Effect of yoga-based exercise program in female patients with myofacial pain of temporomandibular disorders

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Abstract

Objectives The study was conducted to investigate the effect of Yoga-based exercise program on pain, range of motion (ROM), quality of sleep, depression and quality of life in female patients with myofacial pain of temporomandibular disorders (TMD).

Materials and methods 39 Female patients with myofacial pain of TMD were included in the study. Yoga based exercise program was performed to the first group and second group was control group. Visual Analog Scale (VAS), Neck Pain and Disability Scale (NPDS), neck and jaw ROM, Pittsburg Sleep Quality Index (PUQI), Beck Depression Inventory (BDI) and Short Form 36 (SF36) were evaluated. Evaluations were repeated before treatment and 6 weeks later.

Results From the measurements, a decrease in Temporomandibular Joint (TMJ) ($p=0.005$) and neck pain ($p=0.031$) was found to be significant in favor of Yoga Group. It was also observed that the increase in ROM in the neck right lateral flexion ($p=0.001$) in favor of Yoga Group. The sleep quality did not change. In yoga group, a decrease in depression level ($p=0,023$) and increase Quality of life in parameters of physical function ($p=0.023$), vital capacity ($p=0.026$), emotional health ($p=0.002$), mental health ($p=0.080$) were found as significant, statistically.

Conclusions It was concluded that yoga-based exercise program can be used as an alternative program in patients with myofacial pain of TMD. Further study on myofascial pain of TMD is recommended.

Clinical relevance Yoga-based exercise program can be used in patients with myofascial pain due to TMD.

Keywords Temporomandibular disorders · Myofacial pain · Range of motion · Yoga · Quality of lif

Introduction

Temporomandibular Joint (TMJ) disorders reflect the most common problems for masticatory muscles and/or temporomandibular joint and associated structures. Myofascial Pain is the most common form of temporomandibular disorders (TMD). TMD is a psycho-physiological disorder characterized by pain and dysfunction of the masticatory and associated muscles by localized or reflected pain during jaw functions and in cases with mandibular dysfunction, which often involves restriction of mouth opening [1–3].

While the treatment varies according to the pathology, the primary treatment method is considered as conservative management [1–5]. TMD are complicated, so multimodal therapy is recommended for treatment. Therefore, it is recommended that cognitive behavioral therapy, occlusal splint, exercise programs, relaxation techniques should be used. The TMD pain is especially located in the TMJ and neck region. Therefore, it is recommended that posture

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and awareness exercises should be performed to correct the head and neck posture. It has been reported that methods such as hypnosis, meditation and yoga may be useful in the treatment of myofacial pain of TMD [4–10].

It is seen that exercise and conservative physiotherapy management are frequently used in TMJ disorders [5–13]. Long-term yoga practices have been shown to affect the pain center in the brain and improve pain tolerance [7]. Therefore, it has been suggested that yoga could be used in chronic pain management [2, 5, 13, 14]. TMD can be alleviated by psychological support and stress management programs incorporating relaxation techniques such as yoga, meditation, and deep breathing. It is stated that yoga can be used as an alternative therapies in the treatment of temporomandibular disorders [6,, 9, 10, 15].

The effects of conventional and non-invasive treatment methods in patients with myofascial pain dysfunction syndrome (MPD) were investigated by Khan et al. In this study, 30 patients were randomly assigned to one of three groups: a control group (receiving conventional, non-invasive treatment), an experimental group A (receiving conventional, non-invasive treatment, along with raj-yoga meditation therapy and pranayama), and an experimental group B (receiving only raj-yoga meditation therapy and pranayama). Following a three-month course of treatment, a reduction in pain, anxiety and stress levels was observed in the yoga group. It was recommended that longer-term and more detailed studies should be conducted [15]. Consequently, this study was designed to address the need for further research into the use of yoga in the treatment of TMD.

Myofacial pain of TMD is affected by causes such as over tension in muscles, physical fatigue and psychological stress. It has been reported that it is more common in women than men, as 5 times [3, 4, 16]. Since TMD is a psycho-physiological disorder, it is recommended to apply yoga as a relaxation method. However, there is a lack of adequate studies in the literature that include the use of yoga in Myofacial pain of TMD cases. While previous studies have suggested yoga as a beneficial intervention, there remains a lack of standardized treatment protocols specifically tailored for patients with myofascial pain of TMD. Therefore, this study was designed to address this gap by developing and evaluating a yoga-based exercise program as a structured treatment approach. Our aim was to investigate the effect of Yoga based exercise program on pain, range of motion, sleep, depression and quality of life in female patients with Myofacial pain of TMD with the control group. Our hypothesis is that the Yoga-based exercise program will significantly reduce neck and TMJ pain, while improving the range of motion in patients with myofascial pain of temporomandibular disorders (TMD).

Materials and methods

Female patients aged 20–50 years diagnosed with Myofacial pain of TMD according to the Research Diagnostic Criteria for Temporomandibular Disorders (RDC / TMD) [17] at the Dental Hospital were included in the study. Patients were included in the study after diagnosis was made by a dentist with experience in Temporomandibular Disorders.

Those with orthopedic problems such as degenerative arthritis and traumatic injuries, took physiotherapy program in the last 3 months and drug users were not included in the study. According to RDC / TMD, it is needed that the patients should answer ‘yes’ to Question 3 of the examination form for diagnosis of Myofacial pain of TMD; report mild, moderate or severe pain in 3 or more of the 20 muscle regions in the right or left 10 placed in the 9th and 11th questions of the examination form and painful muscles in the examination form must be on the same side as the point where the pain complaint was reported.

The present study was approved by the Non-Interventional Clinical Studies Ethics Committee. All procedures were conducted according to the Declaration of Helsinki. Those who agreed to participate provided written informed consent. Clinical Trial approval was obtained at clinicaltrials.gov with the number of NCT04982601.

In the present study, a computer-aided block randomisation method was employed to guarantee the random allocation of participants to the two groups. Participants were assigned to either the yoga group or the control group in a 1:1 ratio using a random number list generated for this purpose.

This prospective, randomized controlled study was concluded between 2014 and 2020.

Total 46 female patients between the ages of 20–50 were included in the study. Seven women were excluded from the study because they could not continue. In the study, 42 volunteers were divided into two groups as yoga group and control group (Fig. 1). The study was completed with 39 people. Yoga-based exercises were performed for 6 weeks and 3 days in a week for the first group. The second group was taken in the waiting list to be included in the program as a control group.

Yoga-based exercises program

Yoga-based exercises were performed by a physiotherapist has Yoga training, by consisting of 10-person groups, 6 weeks, 3 days in a week for a total of 18 sessions. Yoga-based exercises are Hatha yoga-based sessions consisting of breathing exercises, warm-up exercises, relaxation, asanas exercises and lasts about one hour. Especially combined movements with upper extremity and neck movements and

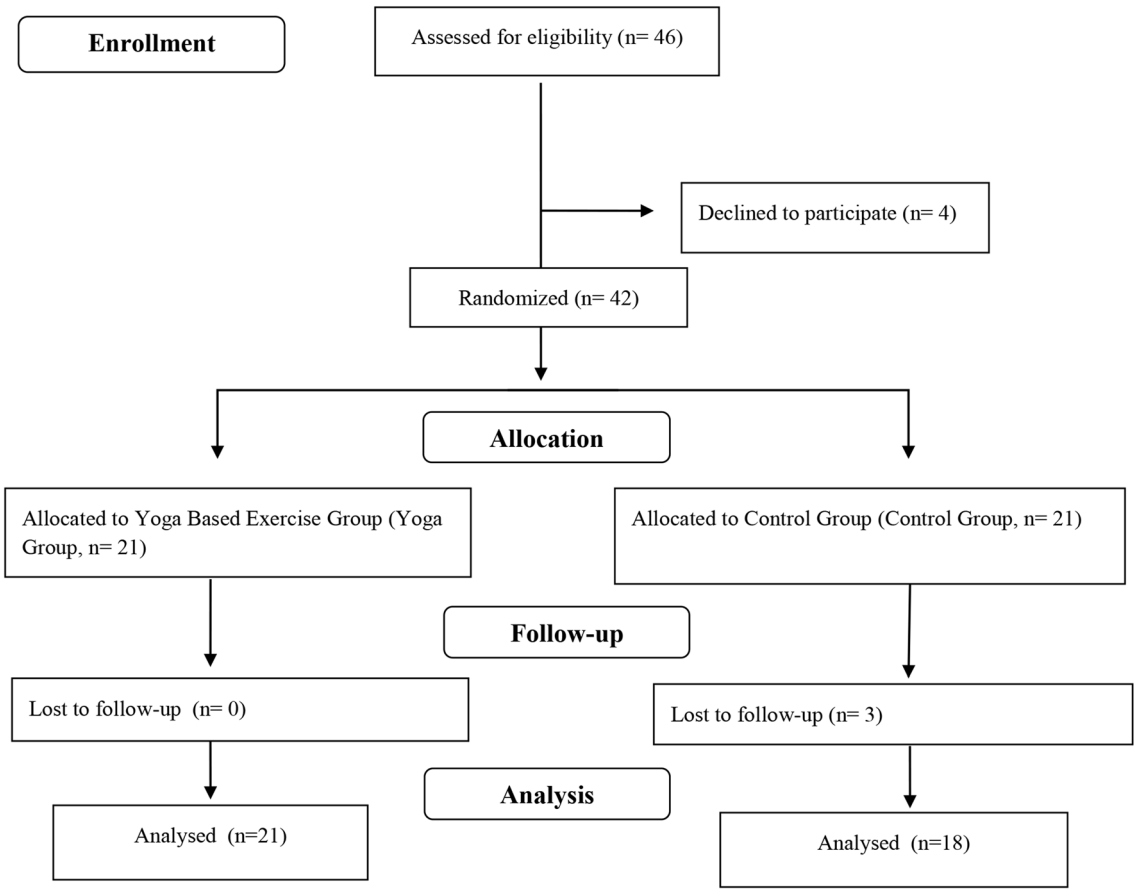

Fig. 1 Flow diagram of the study

breathing exercises were used in breathing exercises. In the warm-up exercises, the muscles were extended by giving exercises especially for stretching the muscles. In this way, asanas were prepared. Asanas Ardra katicahkrasana, padahastasana, trikosana, sasankasana, varaksana poses have been performed. Asanas were modified and applied according to the patient's condition. Relaxation exercises were used both after breathing exercises and at the end of the exercise program. With relaxation, the patients were allowed to leave their muscles relaxed with the whole body relaxation [18].

Control group

The control group was not given exercise. At the end of the study, they were lined up to join the yoga group.

Outcome measurements

Evaluations were made before the treatment and after the 6-week exercise program was finished.

Primary outcome measurements

Pain intensity felt in the TMJ was evaluated with VAS at rest. They were asked to draw their pain level on a 10 cm scale between 0 and 10 points as "0" no pain, "10" unbearable pain [19].

Neck pain; It is examined with Neck Pain and Disability Scale (NPDS). The severity of neck pain, duration of symptoms, and the disability of each item in the specified activities are evaluated. Each item is scored between 0 and 5 points. The total score is the sum of the points in each item and ranges from 0 to 100. High scores indicate more severe pain and effect [20].

Range of motion

The neck and TMJ area of the patients were measured with a ROM universal goniometer. While neck ROM flexion (0–65°), extension (50°), lateral flexion (45°) and rotation (60–80°) were measured, TMJ movements, mandibular depression, protrusion, deviation movements were measured. Measurements were taken 3 times and the mean value was recorded [21].

Secondary outcome measurements

Pittsburg sleep quality scale

Pittsburg Sleep Quality Index (PSQI) is a questionnaire that evaluates sleep quality with questions asked in 7 main topics as: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficacy, sleep disorders, use of sleep medication and daytime functions. Questions are given a score between 0 and 3, high scores reflect poor sleep quality. Each of the seven main titles is evaluated first in itself. The scores of these components are added. Maximum 21 points are taken in total, and 5 points and above are considered as poor sleep quality [22].

Depression assessment

The depression level of the cases was evaluated using the Turkish version of the Beck Depression Inventory (BDI). Each item consists of 4 separate sentences that composed as showing increased severtiy about a specific symptom of depression. The sentences are scored between zero and three to indicate the severity of depression. High scores indicate more severe depression. The highest score that can be obtained in the survey is 63. For evaluation; 0–14 points shows mild depression, 15–29 points shows moderate depression, 30–63 points shows a serious depression level [23].

Table 1 Sociodemographic and clinical characteristics of patients

Characteristics of Patients	Yoga Group ($n=21$) X ± SD	Control Group ($n=18$) X ± SD	p
Age (years)	28.71 ± 8.95	31.83 ± 9.08	0.363
Body mass index (kg/m^2)	22.30 ± 4.13	22.75 ± 3.55	0.723
	n (%)	**n (%)**	
Education level			
Illiterate	2(9.50)	5 (27,75)	0.120
Primary school	2(9.50)	1(5.60)	
Secondary school	5(23.80)	– (0)	
University	10(47.60)	8 (44.40)	
Master degree	2(9.50)	4 (22,20)	
Marital status			
Married	8(38.10)	9(50)	0.336
Single	13(61.90)	9(50)	
Occupation			
Active	7(33.30)	12(66.70)	**0.037***
Retired	1(4.80)	– (0)	
Housewife	3(14.30)	2(11.10)	
Student	7(33.30)	4(22.20)	
Others	3(14.30)	– (0)	

*$p < 0.05$

Quality of life

Turkish version of Short Form 36 (SF-36) was used to evaluate the quality of life. The SF-36 questionnaire with 36 items that measure eight health related quality of life domains: physical functioning (PF), role limitation due to physical problems (RP), bodily pain (BP), general perception of health (GH), energy and vitality (VT), social functioning (SF), role limitation due to emotional problems (RE) and mental health (MH). In the calculation of the results, each subscale is calculated separately. The scores of the subscales vary between 0 and 100, and the high score indicates good health [24]. According to Turkish norm values, quality of life values in women was reported as: PF 80.6 ± 2.17, RP 82.9 ± 28.6, BP 81.0 ± 20.2, GH 69.1 ± 16.9, VT 63.4 ± 13.7, SF 90.1 ± 12.9, RE 89.0 ± 22.5, MH 70.1 ± 11.4 [25].

Statistical analysis

SPSS (Statistical Package for Social Science) 25.0 for Windows was used for statistical analysis. The normal distribution of the variables was tested by the Kolmogorov-Smirnov Test. In the descriptive statistics of the variables, mean, standard deviation and percentage values were presented. The Chi-Square Test was used to analyze nominal data of independent variables, and the Independent Sample T-Test was used to analyze numerical data. Two-Way Repeated Measures of ANOVA was used to analyze time-dependent differences within groups and time-by-group interactions. Additionally, the Analysis of Covariance (ANCOVA) was performed to control for potential confounding variables and to assess the impact of demographic factors such as BMI, age, and educational level on the outcomes. A p-value of less than 0.05 was considered significant.

G*power sample size calculator was used to calculate the sample size. Total sample size was calculated 34 using a repeated-measures design, an effect size of 0.5, and a power of 80% ($\alpha = 0.05$, $\beta = 0.20$, Critical F = 4.1490974, Numerator df = 1.000000, Denominator df = 32.000000) [26]. Considering the possibility of drop-outs, 42 participants were included in the study by calculating 20% more than the sample size.

Results

Total 39 females as 21 females in the yoga-based exercise group, and 18 females in the control group, were included in the study. Age, body mass index (BMI) and socioeconomic status of the participants are shown in Table 1. There was no difference between groups, in terms of their age, BMI, education and marital status.

When the primary and secondary measurements of the groups were compared before the study, the pretreatment groups were similar except for VAS ($p=0.021$), the right neck lateral flexion ROM ($p=0.045$) and left deviation ($p=0.034$) (Tables 2 and 3).

Table 4 shows the comparisons of primary outcome measures before and after treatment, analyzed using two-way ANOVA. While there was a statistically significant decrease in TMJ pain ($p=0.00$) and neck pain scale ($p=0.00$) after treatment in Yoga Group, it was not seen in control group ($p=0.553$ $p=0.223$, respectively). There was a significant difference between the groups in favor of Yoga Group ($p=0.005$, $p=0.031$, respectively). Except for the neck ROM opening to the left lateral flexion ($p=0.176$), a statistically significant improvement was found in Yoga Group. In control group, there was a significant difference only in neck flexion ($p=0.047$) and rotation (right $p=0.001$, left $p=0.012$) movements. Considering the difference between the groups, there was a significant improvement in favor of Yoga Group in the right neck lateral flexion ($p=0.001$) movements. TMJ range of motion, no significant difference was found in the Yoga group except TMJ depression ($p=0.003$).

Table 5 shows the secondary outcome measures, also analyzed using two-way ANOVA. According to the study, there was no difference in sleep quality in both groups. In Yoga Group, while depression ($p=0.023$) decreased, the difference between the groups was not significant. There was a significant improvement in the quality of life sub-scores for Physical functioning ($p=0.023$), Vitality ($p=0.026$), Role of emotional ($p=0.002$), Mental health ($p=0.038$) in Yoga Group. In control group, while there was a significant change in Role of Physical ($p=0.014$) and Role of emotional ($p=0.23$) values, the difference between the groups was not significant. The quality of life was lower in female patients with TMD according to Turkish norm values.

Additionally, to account for potential confounding variables such as BMI, age, and educational level, an ANCOVA analysis was conducted. The results demonstrated that these demographic variables did not exert a statistically significant influence on the outcomes ($p>0.05$), confirming that the observed effects were primarily due to the intervention rather than confounding factors.

Table 2 Comparison of the primary measurements of the groups before the study

	Yoga Group ($n=21$) X ± SD	Control Group ($n=18$) X ± SD	p
VAS(0–10 cm)	4.80 ± 2.56	2.83 ± 2.54	**0.021***
NPDS(0-100)	30.38 ± 21.17	35.05 ± 15.14	0.44
ROM NECK(°)			
Neck flexion (0–65°)	47.85 ± 11.01	48.61 ± 7.63	0.808
Neck extension (0–50°)	40.71 ± 10.03	40.27 ± 8.82	0.887
Lateral flexion R (0–45°)	36.11 ± 9.20	42.50 ± 9.73	**0.045***
Lateral flexion L (0–45°)	40.23 ± 8.13	43.05 ± 11.52	0.378
Rotation R (0–60°)	53.57 ± 14.06	57.33 ± 12.11	0.381
Rotation L (0–60°)	54.76 ± 12.98	64.16 ± 10.88	0.20
ROM TMJ			
Protrusion (0–7.1 cm)	0.36 ± 0.31	0.33 ± 0.24	0.750
Depression (0–6 cm)	3.54 ± 0.83	3.77 ± 1.01	0.454
Deviation R (0–0,9 cm)	0.97 ± 0.37	0.90 ± 0.68	0.684
Deviation L (0–0,9 cm)	1 ± 0.31	0.77 ± 0.32	**0.034***

*$p<0.05$ R: Right L: Left ROM: Range of motion

NPDS: Neck Pain And Disability Scale TMJ: Temporomandibular Joint

Table 3 Comparison of the secondary outcome measurements of the groups before the study

	Yoga Group ($n=21$) X ± SD	Control Group ($n=18$) X ± SD	p
PSQI (0–21)	7.04 ± 3.70	7.61 ± 4.16	0.657
BDI (0–63)	13.09 ± 9.22	15.44 ± 14.70	0.548
SF-36(0-100)			
PF	67.11 ± 23.44	76.66 ± 16.62	0.157
RP	61.90 ± 42.29	50 ± 45.37	0.402
BP	54.57 ± 22.12	55.50 ± 21.46	0.900
GH	49.14 ± 18.86	55.16 ± 21.46	0.357
VT	44.44 ± 19.55	46.11 ± 22.65	0.806
SF	67.85 ± 22.90	66.66 ± 32.36	0.894
RE	35,10 ± 38.69	48.14 ± 46.05	0.343
MH	54.85 ± 19.72	53.77 ± 21.39	0.871

SF-36: Short form 36, PF: Physical Functioning, RP: Role Limitation Due To Physical Problems, BP: Bodily Pain GH: General Perception Of Health VT: Energy And Vitality SF: Social Functioning, RE: Role Limitation Due To Emotional Problems, MH: Mental Health, BDI: Beck depresion İnventory PSQI: Pitsburg Sleep Quality Index
*$p<0.05$

Discussion

It is seen that female patients with Myofacial Pain of TMD and took yoga based exercise program, had decreased TMJ and neck pain, increased ROM, and decreased beck depression level when they compared to the control group. While some parameters quality of life have improved, it has been found that it does not cause any change in quality of sleep.

Most of the patients with TMJ disorder have pain in upper thoracic region, the head and arms, and limitation in neck movements and posture errors as round shoulder and forward tilting of the head [13, 27, 28]. In a study conducted on patients with TMD, it has been reported that relaxation and stretching of the masseter and pterygoids muscles are important [29]. In TMD patients, exercise programs should be given not only to the painful area, but especially to the

Table 4 Comparison of primer measurements of the groups before and after therapy

	Yoga Group ($n=21$) X ± SD			Control Group ($n=18$) X ± SD			Time x Group Interaciton
	Before Therapy	After Therapy	*P*	Before Therapy	After Therapy	*P*	
TMJ VAS	4.80 ± 2.56	2.33 ± 2.19	**0.00***	2.83 ± 2.54	2.58 ± 1.86	0.553	**0.005***
NPDS	30.38 ± 21.17	17.71 ± 14.46	**0.00***	35.05 ± 15.14	31 ± 12.12	0.223	**0.031***
ROM NECK							
Neck flexion	47.85 ± 11.01	52.14 ± 10.07	**0.007***	48.61 ± 7.63	52 ± 5.56	**0.047***	0.676
Neck extension	40.71 ± 10.03	44.52 ± 8.35	**0.042***	40.27 ± 8.82	39.6 ± 10.36	0.647	0.061
Lateral flexion R	36.11 ± 9.20	43.81 ± 9.34	**0.001***	42.50 ± 9.73	41.39 ± 9.82	0.481	**0.001***
Lateral flexion L	40.23 ± 8.13	42.38 ± 784	0.176	43.05 ± 11.52	43.89 ± 11.44	0.636	0.572
Rotation R	53.57 ± 14.06	60.47 ± 9.06	**0.022***	57.33 ± 12.11	66.94 ± 4.37	**0.001**	0.471
Rotation L	54.76 ± 12.98	63.33 ± 13.26	**0.001***	64.16 ± 10.88	69.28 ± 9.53	**0.012**	**0.**241
ROM TMJ							
Protrusion	0.36 ± 0.31	0.39 ± 0.25	0.419	0.33 ± 0.24	0.41 ± 0.37	0.350	0.300
Depression	3.54 ± 0.83	3.84 ± 0.76	**0.003***	3.77 ± 1.01	3.92 ± 0.50	0.469	0.493
Deviation R	0.97 ± 0.37	0.94 ± 0.31	0.444	0.90 ± 0.68	0.74 ± 0.359	0.359	0.425
Deviation L	1 ± 0.31	1.00 ± 0.28	0.906	0.77 ± 0.32	0.84 ± 0.35	0.163	0.245

***p < 0.05** R: Right L: Left VAS: Visuel Analog Scale, TMJ: Temporomandibular joint, ROM: Range of Motion NPDS: Neck Pain And Disability Scale

Table 5 Comparison of the secondary measurements of the groups before and after the treatment

	Yoga Group ($n=21$)			Control Group ($n=18$)			Time x Group Interaciton
	Before Therapy	After Therapy	*P*	Before Therapy	After Therapy	*P*	
PSQI *(0–21)*	7.04 ± 3.70	6.47 ± 3.29	0.446	7.61 ± 4.16	6.83 ± 4.1	0.140	0.824
BDI (0–63)	13.09 ± 9.22	8.81 ± 5.99	**0.023***	15.44 ± 14.70	12.88 ± 15.55	0.153	0.487
SF-36(0-100)							
PF	67.11 ± 23.44	78.95 ± 26.18	**0.023***	76.66 ± 16.62	78.05 ± 14.46	0.72	0.105
RP	61.90 ± 42.29	63.09 ± 40.01	0.897	50 ± 45.37	66.66 ± 35.35	**0.014***	0.178
BP	54.57 ± 22.12	60.61 ± 24.68	0.281	55.50 ± 21.46	54.89 ± 18.18	0.903	0.378
GH	49.14 ± 18.86	55.64 ± 19.43	0.102	55.16 ± 21.46	57.83 ± 17.81	0.203	0.160
VT	44.44 ± 19.55	55.71 ± 21.40	**0.026***	46.11 ± 22.65	48.88 ± 22.85	0.414	0.160
SF	67.85 ± 22.90	75.59 ± 22.52	0.137	66.66 ± 32.36	73.61 ± 27.41	0.269	0.919
RE	35,1 ± 38.69	60.31 ± 44.24	**0.002***	48.16 ± 46.05	68.51 ± 43.49	**0.023***	0.659
MH	54.85 ± 19.72	63.09 ± 19.48	**0.038***	53.77 ± 21.39	55.33 ± 19.65	0.745	0.266

SF-36: Short form 36, PF: Physical Functioning, RP: Role Limitation Due To Physical Problems, BP: Bodily Pain GH: General Perception Of Health VT: Energy And Vitality SF: Social Functioning, RE: Role Limitation Due To Emotional Problems, MH: Mental Health, BDI: Beck depresion İnventory PSQI: Pitsburg Sleep Quality Index *$p < 0.05$

head and neck and related areas. It should especially include posture exercises, stretching and relaxation exercises. It is frequently preferred in chronic cases since it is exercised by handling the whole body in yoga practices. In addition, long-term yoga practices are suggested to affect pain center in the brain and improve pain tolerance [30]. For this reason, in our study, we preferred to apply a Yoga based exercise program that includes strengthening, stretching and relaxation training in order to manage symptoms related to the disease in patients with TMD.

In the study of Gupta et al. [29] examining the effects of myofacial relaxation technique, positional relaxation technique and conventional therapy on pain, mouth opening and functional status, 30 people were divided into 3 groups. Treatment was performed 3 times in a week for 3 weeks. These methods have been shown to be effective in reducing pain, increasing mouth opening and functional status. Myofascial relaxation technique was found to precede from other techniques. In a study which was divided into active exercise, relaxation exercise of masticator muscle and control group for TMD patients with limited normal joint motion and pain; Exercise group has been exercised 3 times for 4 weeks every day. As the results of the study, active exercise and relaxation exercise was found to be an effective treatment for pain and range of motion. It has been found that muscle relaxation exercise is more effective treatment especially in deviation [31]. In the literature, it is seen that the relaxation techniques applied in TMD for 3 days in a week and for 3 or 4 weeks. In our study, it continued 3 times in a week for 6 weeks. The treatment was synchronized with the

duration of the treatment models in the literature, especially by performing one hour. Our difference from the literature is that relaxation-intensive Yoga exercise program is given in the treatment. It is thought that because of yoga practice, the pain decreases due to the increase and the relaxation effect of the whole body, thus increasing the normal range of motion. We think that yoga provides pain control because it is known to control the pain center in the brain. Studies comparing yoga-based exercises with different exercises are needed to determine the most appropriate exercise protocols for TMD.

Raj-yoga with meditation and pranayamas were used in patients with myofascial pain dysfunction (MPD) syndrome, it was emphasized that these practices were promising and results yielded that Raj yoga with meditation and pranayamas may used alone as a treatment tool in MPD syndrome, however more research based on more sample size and longer treatment time is needed [15]. However, we think that studies with a larger sample size are necessary since there is not much study on Yoga practices on patients with MPD syndrome in the literature. We believe that this study will contribute to the literature since there is no standard practice in Yoga based exercise programs in the literature.

Effective management of TMD necessitates an interdisciplinary approach that utilizes a biopsychosocial, patient-centered strategy for screening and evaluation. Empirical research indicates that patients suffering from myofascial pain from TMD exhibit a constellation of symptoms that include stress, depression, and neck disability [16]. It has been reported that TMD is more common in patients with cervical problems [13]. It was observed that subjects with masticator myofascial pain had more disability in the neck regions [32]. In addition, patients with chronic joint pain or myofacial pain are more likely to have neck pain than the patients with mixed chronic pain diagnosis [33]. When we questioned neck pain in our patients, we found that most of them had neck pain and that neck pain decreased significantly in the yoga group. We think that neck pain and the pain due to the TMJ and neck connection decreased due to increase in awareness and correction of the posture, especially with this performed yoga program. Yoga combines physical postures, controlled breathing, and mindfulness, which help to alleviate muscle tension, reduce psychological stress, and enhance overall relaxation. These factors are likely to have contributed to the reduction of neck pain and improved musculoskeletal function in our patients. Additionally, the focus on stretching and strengthening may have improved flexibility and supported better alignment of the musculoskeletal system, further enhancing pain relief and range of motion.

According to a study conducted on yoga programs applied to female medical students, it was determined that yoga has a positive contribution to improving mental health. It is predicted that longer-term yoga practices will help improve mental health [34]. According to a systematic review, it has been observed that Yoga practice, which is performed between 30 and 60 min 3 days in a week, was effective to reduce symptoms of anxiety, depression and pain. However, it was observed that the results differed according to the type of yoga, its environment and the characteristics of the population applied [14]. In our study, we preferred to practice yoga for 60 min, 3 days in a week. We believe that there is a significant decrease in the level of depression due to the control of pain with yoga practices and the increase in normal range of motion due to exercises included in the yoga practices. However, we think that, since the disease is chronic, the prolonged exercise of these patients can be more effective on the decrease in depression level.

It is seen that the quality of life of TMD patients is affected. According to the study examining the duration of pain and quality of life in patients with TMD; patients with TMD pain less than a year have been reported to have better score than the population norm. However, while those who suffer from longer pain, mental health and emotional problems are not seriously affected, social functionality appears to be significantly affected [35]. According to a systematic review A patient-centered approach is recommended, and oral health-related quality of life measures should be included in the clinical evaluation of TMDs [36]. The study showed that core stability training in individuals with TMD did not contribute positively to oral health-related quality of life [37]. In our study, it is seen that the quality of life of the participants was lower according to the Turkish norm values [25]. In addition, although the quality of life in the yoga group improved in Physical functioning, Vitality, Role of emotional, Mental health parameters, there was no difference between the two groups. We think that this may be due to the low quality of life values in this group of patients compared to normal values and the quality of life being affected by different factors. We also think that it is necessary to follow the studies on quality of life in patients with Myofacial Pain of TMD through long-term follow-up studies.

Although the relationship of cause and effect between sleep disorders and TMD has not been proven in TMD patients, it seems that the sleep problem is quite high in this disease. Since TMD has different types, different sleep problems can be seen in everyone. It is said that PSQI can be used to evaluate of sleep in patients with TMD. In this way, treatment should be drawn to improve sleep quality when necessary [38, 39]. In our study, we used PSQI for sleep evaluation. There was no significant difference in sleep quality in our study. We think that this situation is caused by a mild sleep problem in patients with Myofacial Pain of

TMD. We suggest that studies examining sleep levels and problems are needed in these patients.

Sleep quality and quality of life in TMD patients are influenced by physical, psychological and lifestyle factors. The long-term effects of yoga and other exercise on these outcomes should be investigated. Research should focus on determining the optimal frequency, intensity, and duration of yoga practice that can lead to sustained improvements in sleep quality and overall quality of life. Longitudinal studies that follow patients for extended periods are needed to better understand the lasting benefits and potential relapse of symptoms.

One limitation of this study is the initial difference in VAS scores between the groups, which was not controlled for in the inclusion criteria. While this could be seen as a potential bias, we believe that the difference did not negatively affect the outcomes. Despite the higher initial VAS scores in the yoga group, this group demonstrated a more rapid reduction in pain levels, which highlights the effectiveness of the intervention.

The strength of our study is that it is performed in female patients with Myofacial Pain of TMD. In addition, practicing yoga-based exercise 3 days in a week is the strongest aspect of our program. We think that our study has a limitation in terms of quality of life and sleep quality, with a 6-week treatment period and no long-term follow-up. Especially in terms of quality of life and sleep quality, long-term follow-up studies are needed.

Conclusion

According to our study, it was concluded that Yoga based exercises are an alternative treatment method that can be used to decrease TMJ and neck pain, increase range of motion, and decrease depression level in female patients with Myofacial Pain of TMD compared to the control group.

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Data availability No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to informed The present study was approved by the Istanbul Medipol University Non-Interventional Clinical Studies Ethics Committee with the decision no: 10840098-07. Participants were informed about the purpose and procedure of the study before participation and that they could withdraw from the study at any time without explanation. Informed consent was obtained from participants with the Voluntary Informed Consent Form. All stages of the study were conducted according to the ethical principles set by the Declaration of Helsinki. Clinical Trial approval was obtained at clinicaltrials.gov with the number of NCT04982601.

Competing interests The authors declare no competing interests.

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