



# EFFECT OF PATELLAR MOBILIZATION AND RESISTANCE TRAINING IN POST MENOPAUSAL WOMEN WITH KNEE OSTEOARTHRITIS

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## ABSTRACT

In this randomized controlled trial, 45 postmenopausal women with age between 45-60 years suffering from knee osteoarthritis were taken. Subjects were randomly allocated into three groups: patellar mobilization group (group-I) received patellar mobilization (group-II), resistance training group (group-III) received strengthening exercises and control group received low impact aerobic exercises for 3 sessions per week up to 4 weeks. The primary outcome of this study was knee pain evaluated by visual analog scale (VAS) and Western Ontario And McMaster Osteoarthritis Index (WOMAC) score, second was range of motion (ROM) measured by goniometer. All outcomes were evaluated at baseline and at 4 weeks after the given treatment. Result showed that VAS score was statistically significant (p value <0.05) in group 1, ROM in all three groups and WOMAC scores in group 1 and group 2. Therefore, study showed that patellar mobilization group showed greater improvement than the other groups for all the outcome measures except ROM.

**Keywords:** knee osteoarthritis, patellar mobilization, resistance exercises, randomized controlled trial.

## INTRODUCTION

Osteoarthritis is a disease that progresses over time characterized by joint inflammation and leads to the destruction of articular cartilage and joints.<sup>[1]</sup> Primal Healthcare limited quoted a statement recently in a campaign occurring nationwide against chronic disease that India is expected to be the chronic disease capital with 60 million people with arthritis, by 2025.<sup>[2]</sup>

Knee pain, stiffness, decreased muscle strength and proprioception deficits are the major symptoms associated with knee osteoarthritis in individuals.<sup>[3]</sup> Osteoarthritis is more likely to be prone in women than in men and it increases the prevalence, incidence, severity after menopause occurring between the age of 45-60 yrs.<sup>[4-6]</sup> Indeed, a nationwide population survey recorded that osteoarthritis is three times more common in women of age 45-60 years in comparison to males.<sup>[5]</sup> Menopause is described as the permanent cessation of ovarian function and the end of the reproductive potential.<sup>[8]</sup> When the menstruation period does not occur for complete 12 months then the women enter into the post-menopausal period.<sup>[9]</sup> The menopausal progression mostly begin between the age of 45-55 yrs. The process of menopause with knee osteoarthritis is followed by many biological and physiological changes such as loss of skin flexibility, vasomotor symptoms such as night sweats, hot flashes, urinary tract infections

incontinence, bone loss may occur.<sup>[11-13]</sup> Muscle and joint changes are also mainly observed in postmenopausal women.<sup>[14,15]</sup> Many studies reported that strength of quadriceps muscles are usually diminished in the patients of knee osteoarthritis.<sup>[16-18]</sup> Decreased level of estrogen for long period of time can result into decreased bone mineral density, reduction in muscle strength and flexibility, impairment of muscle performance and functional capacity.<sup>[23,24]</sup>

It is strong evidence that exercises is becoming one of the most important alternative treatment procedures.<sup>[26,27]</sup> There are some researches that stated that resistance training may result in increased muscle strength, range of motion and functional ability with patients of knee osteoarthritis.<sup>[29-31]</sup> Some study reported that manual therapy have found to produce greater effect in the treatment of knee osteoarthritis<sup>[32-35]</sup> Previous studies also showed that patello-femoral joint osteoarthritis is a major source of pain in knee osteoarthritis.<sup>[36-38]</sup> However, few trials showed the role of manual therapy targeting patella-femoral joint but shows limitations as methodological rigor or heterogeneous interventions.<sup>[39,40]</sup> The aim of this study was to evaluate the effect of patellar mobilization and resistance training in knee osteoarthritis among post-menopausal women. We hypothesized that the subject that with increased range of motion and improvement in functional activity compared with subjects who do not received above treatment.

## MATERIALS AND METHODOLOGY

This study of Randomized Controlled Trial was approved by Departmental Ethical Committee wide letter no. PTY/2022/155 on 21-04-2022. We prospectively registered the study at the Clinical Trials Registry- India (CTRI) with registration no. (CTRI/2022//06/043099).

### Participants and Study Settings

This was a randomized, single blinded, longitudinal, parallel and multiple arm trial. 79 Post-menopausal women with knee osteoarthritis of the age group of 45-60 years were invited for this study. Out of which 64

women met the inclusion criteria and at the end 45 women agree to participate in the study. Osteoarthritis was diagnosed on the basis of clinical history, radiographic findings and physical examination done by the therapist himself.

### Inclusion Criteria

The women who were in the age group of 45-60 years, who had experienced amenorrhea for at least 12 months, who were able to do exercises, who experienced menopause naturally, who were diagnosed with knee osteoarthritis whose knee pain score was  $>2$  while doing activities such as prolonged sitting, crossed legged and stairs climbing.

### Exclusion Criteria

The women who were using drugs for relieving menopausal symptoms, who had coronary artery disease, diabetes, disorders of thromboembolism, psychiatric illness, unable to do exercises, hypertension, gynecological cancers, surgical menopause, obesity(BMI $>30$ ), history of surgery on knee and women using hormonal therapy.

### Randomized, Allocation and Blinding

After the consent form was filled and baseline data was collected, participant were randomly divided into 3 groups by lottery system. 15 women were allocated in Intervention Group 1 provided with patellar mobilization, other 15 women were allocated in Intervention Group 2 provided with resistance exercises and the rest 15 women were allocated in group 3 which was a Control group which includes sticking up to their daily routine activities with some low impact exercises and hot pack. This is a single blinded study in which patients were kept unaware of their treatment. Neither group was aware of the treatment given to other group.

### Outcome measures

Data for all outcomes measures were collected at the starting and again at 4 weeks after the treatment. The primary outcome which was pain and calculated by the Visual Analog Scale (VAS). The other primary outcome was range of motion of knee joint (knee flexion and extension) which were measured by goniometer. The Western Ontario and McMaster Osteoarthritis Index) questionnaire (WOMAC) score was also calculated by filling the questionnaire. The WOMAC is a reference standard for self measures in knee osteoarthritis trials. Participant's demographic details were obtained.

## PROCEDURE

Every group received different treatment to find the efficacy of the patellar mobilization and resistance training in knee osteoarthritis in postmenopausal women. Patient with pain in both legs received treatment in

both legs. Control group also received some type of treatment so that patient feel secured that they also had received some treatment.

#### Intervention Group-I

This group received patello-femoral mobilization therapy provided by trained physiotherapist. Patello-femoral mobilization was given to patients in supine with knee supported with wedge or towel roll and index finger placed along patellar border oriented to direction of mobilization applied laterally, medially, inferiorly and superiorly. The mobilization treatment was done only for 5 minutes comprising of four to six mobilization series for 30–40 seconds for three sessions in a week for 4 weeks.

#### Intervention Group-II

This group received resistance training. It includes strengthening of hamstrings and quadriceps muscles. The treatment was given for 40 – 45 minutes for three sessions in a week for 4 weeks.

#### Control Group

The control group also received some low impact exercises with hot pack. All the patients received effective treatment for 4 weeks.

### DATA ANALYSIS

The data was analysed using software SPSS version 21. Descriptive statistics were obtained by calculating mean and standard deviation of all the variables of pre and post readings. Paired T test was done to compare the pre and post values within the test. We performed analysis of covariance test to compare the outcomes of interventions groups and control group. P value of  $\leq 0.5$  was considered statistically significant.

### RESULTS

The trial was started with 45 female participants. Among participants, 15 were treated in Intervention group-I, 15 were treated in Intervention group-II and 15 were treated in control group. The general characteristics of the participants were shown in Table 1. The mean and standard deviation of pre and post readings of the study parameters of all the groups were shown in Table 2. There is no statistically significant difference between outcomes and demographic at baseline means that the baseline data was normal.

Table 1. General Characteristics of Participants

Characteristics	Group- I	Group- II	Group- III
Age (years)	52.33±4.53	52.40±5.03	52.33±4.74
Weight (kg)	63.90±5.44	68.00±5.60	65.58±4.83
Height (cm)	163.74±4.28	162.20±6.63	163.34±5.63
BMI	23.88±1.84	25.86±1.81	24.60±1.73

Table 2. Study Parameters

	Group-I	Group-II	Group-III
VAS Pre	8.06±1.38	7.93±1.48	7.66±1.58
VAS Post	4.06±1.57	5±1.55	6.60±1.80
ROM Flexion Pre	100.46±21.98	98.66±15.44	99.40±14.22
ROM Flexion Post	114.13±18.88	107.80±14.29	103.46±14.92
ROM Extension Pre	8.20±2.07	8.93±2.12	9.33±2.02
ROM Extension Post	2.66±2.19	5±2.5	7.40±2.38
WOMAC Score Pre	64.86±8.80	72.53±12.19	69.26±10.54
WOMAC Score Post	45.53±8.81	62.26±12.36	63.93±10.91

VAS- visual analog scale, ROM –range of motion, WOMAC - Western Ontario and McMaster Osteoarthritis Index

Table 3. Comparison of outcomes within groups

		Group-I		Group-II		Group-III	
		Pre	Post	Pre	Post	Pre	Post
VAS	Mean±S.D	8.06±1.38	4.06±1.57	7.93±1.48	5±1.55	7.66±1.58	6.60±1.80
	T value	18.33		4.67		7.64	
	P value	<0.05		>0.05		>0.05	
Flexion	Mean±S.D	100.46±21.98	114.13±18.88	98.66±15.44	107.80±14.2	99.40±14.22	103.46±14.92
	T value	-12.29		-2.70		-11.36	
	P value	<0.05		<0.05		<0.05	
Extension	Mean±S.D	8.20±2.07	2.66±2.19	8.93±2.12	5±2.50	9.33±2.02	7.40±2.38
	T value	19.04		10.64		9.13	
	P value	<0.05		<0.05		<0.05	
WOMAC	Mean±S.D	64.86±8.80	45.83±8.81	72.53±12.19	62.26±12.36	69.26±10.54	63.93±10.91
	T value	15.77		7.26		11.18	
	P value	<0.05		<0.05		<0.05	

There was a significant improvement in terms of pain, ROM and WOMAC scores after treatment in Intervention groups and Control group.

VAS- visual analog scale, ROM –range of motion, WOMAC - Western Ontario and McMaster Osteoarthritis Index

Variables		Mean± S.D.	P value	F- test
VAS	Group-I	4.06±1.57	<0.05	9.02
	Group-II	5±1.55		
	Group-III	6.60±1.80		
Flexion	Group-I	114.13±18.88	>0.05	1.65
	Group-II	107.80±14.29		
	Group-III	103.46±14.92		
Extension	Group-I	7.66±2.19	<0.05	15.02
	Group-II	5±2.50		
	Group-III	2.40±2.38		
WOMAC	Group-I	45.53±8.81	<0.05	13.32
	Group-II	62.26±12.36		
	Group-III	63.93±10.91		

**Table 3. Comparison of outcomes between groups**

Participants in Intervention group-I showed significant difference in pain, range of motion and WOMAC score as compared to Intervention group-II and Control group after 4 weeks.

VAS- visual analog scale, ROM –range of motion, WOMAC - Western Ontario And McMaster Osteoarthritis Index

## DISCUSSION

Osteoarthritis is the most frequent joint disease with a prevalence of 22% to 39% in India. Osteoarthritis is more common in women and is the major cause of mobility impairment in females resulting in physical inactivity. The patients grouped into patellar mobilization group who received patellar mobilization, resistance group who received resistance exercises and control group who received hot pack with low impact exercises. The treatment was given for three sessions for 4 weeks. The mean and standard deviation of all the outcome variables of pre and post study were calculated.

The result showed significant improvement in pain, range of motion of flexion and extension and WOMAC Score of all the three groups. On comparison between three groups, Group-I showed more significant improvement in pain, range of motion of knee and WOMAC score than Group-II and Group-II showed more improvement than Group- III. This study concluded that Patellar mobilization was effective treatment in knee OA and also supported by previous literature. This study showed that patellar mobilization was effective in reducing pain and increasing range of motion and WOMAC score significantly.. There are many studies which shows that patellar mobilization intervention is beneficial in pain reduction, range of motion of knee and improve quality of life. Wing Shan Sit (2018) patellar mobilization stated that this technique has the ability to overcome pain and provide improvement in range of motion and produce positive effect on quality of life. This

technique will align the patella in its position. Baraa Hussain(2019) did a study on patellar mobilization and suggested that 6 weeks of patella-femoral mobilization leads to loss of pain, improved range of motion and improves flexibility. It also leads to improvement in nutrition, blood flow and lubrication in the knee that helps in mobility.

Witvrouw(2000) stated in his study that medial and lateral patella mobilization was proven to be beneficial but the finding were not significant. There are many studies which show patellar mobilization in combination with exercises. In this present study, it was statistically proven that group received patellar mobilization shows greater improvement as the  $p < 0.05$  in all the outcomes as compared to other groups. Our study has some limitations. First, the sample size was small. Second, the age group was wide. Third was the short treatment session.

This study concluded that patellar mobilization was found to be beneficial in improving pain, range of motion and WOMAC score in patients with knee osteoarthritis.

Conflict of interest - None

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