

## Research Article

# Efficacy of posterolateral hip muscles strengthening on patellofemoral pain

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## ABSTRACT

**Background:** Patellofemoral pain syndrome (PFPS) is a syndrome characterized by pain or discomfort seemingly originating from the contact of the posterior surface of the patella (back of the kneecap) with the femur (thigh bone). Moderate evidence supports the addition of hip abductor and external rotator strengthening, as well as exercises targeting hip flexion and hip extension.

**Methods:** 30 patients were taken from OPD of Department of Orthopedics, Guru Gobind Singh Medical College and Hospital, OPD of University College of Physiotherapy, Faridkot, Punjab, India. The patients were divided into two groups (15 patients each group). Group A was treated with quadriceps strengthening, Group B were treated with quadriceps strengthening with posterolateral hip strengthening (hip abductors and external rotators). Total treatment duration was 4 weeks. Both the groups were assessed for Pain (visual analog scale [VAS]) and health status (Western Ontario McMaster Universities Osteoarthritis Index [WOMAC]). Follow up was done on 2nd and 4th week.

**Results:** Significant improvements in VAS and WOMAC scores were observed in both groups from 0th-week to 2nd week and 0-week to 4th-week follow-up ( $P < 0.05$ ). Improvements in VAS and WOMAC scores in group B were superior to those in group A at 4-week follow-up ( $P < 0.05$ ).

**Conclusions:** The present study has concluded that both Group A and Group B were effective in the management of patello-femoral pain but statistically it was concluded that Group B is more effective as compared to Group A.

**Keywords:** Patellofemoral pain, Quadriceps strengthening, Posterolateral hip strengthening, VAS, WOMAC index

## INTRODUCTION

Patellofemoral pain syndrome (PFPS) is a syndrome characterized by pain or discomfort seemingly originating from the contact of the posterior surface of the patella (back of the kneecap) with the femur (thigh bone).

Patellofemoral pain syndrome (PFPS) is one of the most common causes of knee pain seen in family medicine, sports medicine, and orthopedic clinics. PFPS is known by several other names, including runner's knee and anterior knee pain.<sup>1</sup> The under-surface of the patella has a notch which is designed to glide over a groove in the femur as the knee flexes and extends. When the patella is unable to glide smoothly in the groove, the under surface

of the kneecap and other structures in the knee become irritated, causing pain in and around the knee.

PFPS is remarkably common, accounting for up to 25% of all knee injuries presenting to sports medicine clinics.<sup>5</sup> Eleven percent of musculoskeletal complaints in the office setting are caused by anterior knee pain (which most commonly results from PFPS), and PFPS constitutes 16 to 25 percent of all injuries in runners.<sup>3,9,12</sup> Many authors claim that PFPS is one of the most common musculoskeletal disorders, and that it tends to affect the people with age group 18-45 years. Many authors have reported on the occurrence of PFPS in a given population, with several authors reporting its occurrence in one-fourth of the general or sporting

population.<sup>13</sup> However, the reported prevalence is often based on unclear original data sources. A recent study claims that the estimated incidence or prevalence of PFPS in the adult general population is based almost entirely from source data from sports-medicine or military settings, and hence that the incidence of PFPS in the general population is not known.<sup>2</sup> There is strong evidence for the efficacy for a multimodal physiotherapy approach targeting distal and proximal influences as compared with placebo in the short term.<sup>4</sup> The efficacy of conservative treatment options, including exercise, on pain levels in the treatment of PFPS have been investigated in two recent systematic reviews.<sup>1,4</sup> It was reported that the proximal exercise group had significantly greater improvement in pain at four weeks compared with the knee exercises group, but functional outcome was the same.<sup>7</sup> When compared only knee exercises to a combined program of knee and proximal exercises, significant difference between groups (favoring the combined program) for all outcome measures at three, six and twelve months was noted.<sup>8</sup>

The purpose of the current study was compare the immediate and short-term efficacy of posterolateral hip strengthening and quadriceps strengthening versus quadriceps strengthening alone in reducing pain and improving health status in persons with PFP.

## METHODS

An experimental study design was used for the purposes of the current study. 30 Patients diagnosed with unilateral patello-femoral pain were drawn from out-patient physiotherapy department in University College of Physiotherapy, Faridkot, Punjab, India. After the assessment patients were divided into two groups, Group A and Group B based on randomization. Randomization was done by simple random sampling. After baseline assessment, participants drew one of 30 pre-printed cards in opaque sealed envelopes from a box (15 labeled group A and 15 labeled group B) and were placed in the intervention or control group in accordance with the card drawn. The eligible patients were duly informed of the

rationale and procedure for the study and were enlightened about the aim of the research in improving physiotherapy services to patients with patellofemoral pain. Thereafter, informed consent was obtained from each patient and confidentiality was ensured.

## Inclusion and exclusion criteria

The inclusion criterion was subjects of both genders, Age groups between 18-45 years, Patients with unilateral patellofemoral pain, Symptoms that had been present for <6 months, Patients who are having either three of the following symptom: 1. Presence of pain on the stairs, (up or down), 2. Pain when sat with the knee flexed (cinema sign), 3. Pain when squat or kneeling, or return from these positions, 4. Positive patellofemoral grinding test. 10 Patient was excluded if they had history of ligamentous laxity, meniscal injury, bursitis, iliotibial band syndrome, patella fracture, knee surgery, previous physical therapy, plica syndrome, and osgood-schlatter disease.

## Intervention

Patients were assessed at 0<sup>th</sup> day before giving treatment and follow up of patients were done at the end of 2<sup>nd</sup> week and 4<sup>th</sup> week after completing the treatment. Visual Analog Scale (VAS), health status (Western Ontario McMaster Universities Osteoarthritis Index [WOMAC]) was checked. Study participants completed exercises supervised by a physical therapist 5 times per week for 4 week. Each session consisted of 10 minutes of hot fermentation (by means of moist heating pads or electrical heating pads), 20-30 minutes of directed exercise, and 5 minutes of cool down (walking around the gym at a self-selected pace) that is total treatment time was 45 minutes approximately. Patients assigned to both groups performed standardized protocols. Resistance and repetitions were progressed at 1-week intervals (Table 1). Thera band elastic tube was used to provide resistance during each exercise. All subjects completed the required number of treatment sessions over the 4-week intervention period.

**Table 1: Standardized exercise progression using elastic tubing<sup>10</sup>**

Week	Set 1	Set 2	Set 3	Frequency/wk
0-1	Yellow (20)	Red (20)	Green (20)	3
1-2	Yellow (25)	Red (25)	Green (25)	3
2-3	Red (20)	Green (20)	Blue (20)	3
3-4	Red (25)	Green (25)	Blue (25)	3

**Group A (control group):** Patients in Group A received conventional physiotherapy consisting of 2 quadriceps exercises only with the use of thera-band elastic tube. Patients became familiar with the exercises by verbal

instruction, demonstration and practice, before being instructed to perform the exercises.

**Group B (intervention group):** Patients allocated to this group received the same treatment as the Group A with posterolateral hip strengthening exercises (hip abductors and external rotators) was added.

### Outcome measures

#### VAS (Visual analogue scale)

It was used to assess the severity of pain which is represented from (0) position to (10) position. Zero position means no pain, (10) position unbearable pain, from 1 to 10 means graduation intensities of pain.

The subjects were asked to indicate the level of pain by placing a dash at the appropriate level on the 10 cm horizontal line.

#### WOMAC (Western Ontario and McMaster University)

The WOMAC consists of three subscales<sup>15</sup>. The pain subscale (P subscale) includes five questions, the stiffness subscale (S subscale) includes two questions and the physical function subscale (PF subscale) includes 17 questions.

### Data analysis

Data was analyzed using SPSS version 20 software. Paired t test was used for comparison at 0<sup>th</sup> week to after 2<sup>nd</sup> week, after 2<sup>nd</sup> week to 4<sup>th</sup> week and at 0<sup>th</sup> week to 4<sup>th</sup> week score measurement of VAS and WOMAC of Group A. Paired t test was used for comparison at 0<sup>th</sup> week to after 2<sup>nd</sup> week, after 2<sup>nd</sup> week to 4<sup>th</sup> week and at 0<sup>th</sup> week to 4<sup>th</sup> week score measurement of VAS and WOMAC Group B.

Independent t test was used for inter comparison Group A and Group B at 0<sup>th</sup> week, after 2<sup>nd</sup> week and after 4<sup>th</sup> week score measurement of VAS and WOMAC.

## RESULTS

All patients were moderately to severely impair with respect to pain intensity and health status. All patients carried out same treatment plan and completed the treatment plan.

**Table 2: Demographic details of the patients of Group A.**

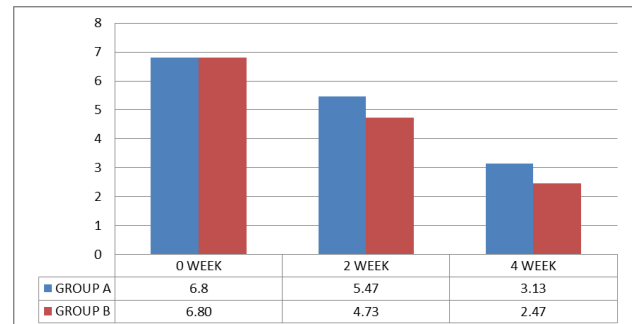
Age		N=15	
Mean	S.D	Males	Females
29.33	7.7244	7	8

Table 2 shows demographic details of the patients. Total 15 patients were taken in Group A out of which 7 were males and 8 were females with mean age of 29.3 and S.D 7.7244.

**Table 3: Demographic details of the patients of Group B.**

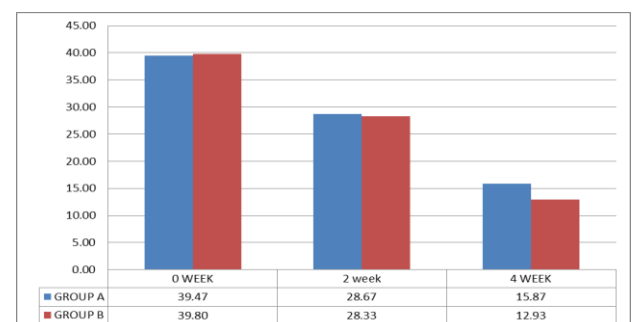
Age		N=15	
Mean	S.D	Males	Females
28.0	8.3066	8	7

Table 3 shows demographic details of the patients. Total 15 patients were taken in Group A out of which 8 were males and 7 were females with mean age of 28.0 and S.D 8.3066.



**Figure 1: Intergroup comparison of VAS.**

Figure 1 shows that there is a significant difference in pain intensity in group B than group A measured using VAS (Visual analogue scale) when assessed at three different interval that is at 0<sup>th</sup>, 2<sup>nd</sup> week and 4<sup>th</sup> week.



**Figure 2: Intergroup comparison of WOMAC.**

Figure 2 shows that there is a significant difference in physical health status in group B than group A measured using WOMAC (Western Ontario and McMaster University) index when assessed at three different interval that is at 0<sup>th</sup>, 2<sup>nd</sup> week and 4<sup>th</sup> week.

## DISCUSSION

The study has concluded that quadriceps strengthening alone and posterolateral hip muscle strengthening combined with quadriceps strengthening are effective in the management of patellofemoral pain. However, statistically it was concluded that posterolateral hip muscle strengthening combined with quadriceps strengthening are more effective as compared to alone quadriceps strengthening.

Patients who had received posterolateral hip muscle strengthening combined with quadriceps strengthening showed decrease in pain and improving functional abilities as compared to those who received alone quadriceps strengthening. The better outcome with posterolateral hip muscle strengthening could be due to the reason that the posterolateral hip musculature contributes to control ground reaction forces and the dynamic valgus alignment of the lower extremity during daily activities.

Khayambashi K et al studied the effectiveness posterolateral hip muscle strengthening versus quadriceps strengthening for patello-femoral pain. More improvement was seen in posterolateral hip muscle strengthening group as compared with quadriceps strengthening group. This study is relevant with the present study for the use of posterolateral hip muscle strengthening in patello-femoral pain patients.<sup>10</sup>

Kimberly et al studied the effect of hip strengthening prior to functional exercises. For patients with PFPS, initial hip strengthening may allow an earlier dissipation of pain than exercises focused on the quadriceps and concluded that for patients with PFPS, initial hip strengthening allows an earlier dissipation of pain than exercises focused on the quadriceps. This study is relevant with the present study for the use of posterolateral hip muscle strengthening in patello-femoral pain patients.<sup>11</sup>

## CONCLUSION

The present study has concluded that quadriceps strengthening alone and posterolateral hip muscle strengthening combined with quadriceps strengthening are effective in the management of patello-femoral pain. However, statistically it was concluded that posterolateral hip muscle strengthening combined with quadriceps strengthening are more effective as compared to alone quadriceps strengthening. Thus, posterolateral hip muscle strengthening should be implemented in physiotherapy protocol of patello-femoral pain management. And it will be helpful in reducing the level of pain and thus improving the functional status of an individual suffering from patello-femoral pain.

## Limitations of the study

There were few limitations of this study as the number of the subjects taken was very less, study involves short follow up, and so no conclusions can be drawn about the long- term benefits of the treatment. The study was conducted only in limited area of Punjab, India. Other areas can also be involved.

## Future scope

Future studies should include long term follow up more than two months; further study can be done by using

different outcomes measures, Study can be done on large sample size.

## Implications for practice

No major side effects were associated with muscle strengthening exercises.

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