ORIGINAL RESEARCH

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EFFECTS OF KINESIOTAPING ALONG WITH QUADRICEPS STRENGTHENING EXERCISES ON PAIN, JOINT RANGE OF MOTION AND FUNCTIONAL ACTIVITIES OF KNEE IN SUBJECTS WITH PATELLOFEMORAL OSTEOARTHRITIS

M. Harshitha[1]
K. Senthil kumar[2]
K. Madhavi[3]

ABSTRACT

Background: Patello femoral Osteoarthritis is the most common degenerative disease in older age group, causing pain, physical disability, and decreased quality of life.As many treatment options available, kinesiotaping is an efficacious treatment for management of pain & disability in patellofemoral joint osteoarthritis. Previous studies have shown that kinesiotaping as well as quadriceps strengthening significantly yields functional benefits. But there is lack of evidence revealing combined effectiveness & effects of kinesiotaping along with quadriceps strengthening in subjects with patellofemoral joint osteoarthritis.

Methods: 30 subjects with symptoms of patellofemoral osteoarthritis fulfilled the inclusion criteria were randomly assigned into 2 groups of 15 in each group. Taping along with quadriceps strengthening program is compared to the quadriceps strengthening program alone. Pain were measured by Visual Analogue Scale (VAS), knee ROM were measured by Goniometer, Functional status were measured by Western Ontario McMaster Universities index (WOMAC), score. Measurements were taken pre & post intervention.

Results: The results indicated that kinesiotaping along with quadriceps strengthening exercises showed there was statistically significant improvement in pain (<0.05), knee ROM (<0.05) and functional activities (<0.05) after 6 weeks compared to quadriceps strengthening alone.

Conclusion: Subjects with kinesiotaping along with quadriceps strengthening showed significant improvement in reducing pain, in improving ROM & functional activities at the end of 6th week treatment when compared to subjects with patellofemoral osteoarthritis underwent quadriceps strengthening exercises alone.

Keywords: Patellofemoral osteoarthritis, kinesiotaping, quadriceps strengthening.

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CORRESPONDING AUTHOR

[1] **M. Harshitha,**
MPT Post graduate Student,
College of Physiotherapy,
Sri Venkateswara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India.
e-Mail: harshithaphysio370@gmail.com

[2] Assistant Professor, College of Physiotherapy, Sri Venkateswara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India.
[3] Principal, College of Physiotherapy, Sri Venkateswara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India.

INTRODUCTION

Osteoarthritis (OA) is a prevalent musculoskeletal condition in older age group, causing pain, physical disability, and decreased quality of life. It also imposes a considerable economic burden on the health care system.[1]The pain and physical dysfunction of knee OA are often associated with structural damage in the patellofemoral joint (e.g., osteophytes, joint space narrowing, and reduced cartilage volume).[2-4]

The most common involvement site of the osteoarthritis knee is the medial tibiofemoral joint and the patellofemoral joint .Within the PFJ, the lateral compartment is more frequently affected by the OA process than the medial compartment.[5]

The prevalence of OA in people aged over 55 years is 20–26% and rising, with arthritis rates expected to increase by 30% over the next 40 years[6].In a community-based study of knee OA, in Australia the frequency of radiographic osteophytes was greater in the PFJ (65%) than in the tibiofemoral joint (TFJ) (55%). Furthermore, in people with knee pain, the most common compartmental distribution of radiographic OA was a combination of TFJ and PFJ disease (40%), followed by isolated PFJ OA (24%), and isolated TFJ disease (4%).[6]

Osteoarthritis (OA) of knee is a common disease affecting thousands of Indian citizens.[7]

The risk factors are Overuse, trauma, muscle dysfunction, tight lateral restraints, Patellar hypermobility, Poor quadriceps flexibility. Typical symptoms include pain behind or around the patella that is increased with activities that involve knee flexion.[8]

The clinical findings are anterior knee pain, weakness of quadriceps muscle, crepitus during knee movement, peripatellar tenderness,pain on compression of the patella and limitation of patellar mobility.[9]

Patellar taping is postulated to improve patellar alignment. The alignment of the patella within the femoral trochlea influences the magnitude and location of patellofemoral joint force .Although patellar malalignment is considered to be a feature of patellofemoral joint pain in younger populations.[9]

Patellofemoral pain is associated with activities that load on the patellofemoral joint such as walking, stair climbing, squatting, prolonged sitting& sitting to standing. Malalignment of the patella, with consequential abnormal force distribution on the lateral facet, is thought to be the cause of pain, particularly during stair climbing, squatting, or kneeling.[10]

Inexpensive interventions that give patients some control over their symptoms are particularly attractive. If effective, they could reduce the financial burden of these patients as well as improve the quality of life.[10]

There is no specific treatment to alter the disease; current treatment is focused in reducing symptoms and enhancing function.[11] Analgesic and anti-inflammatory drugs are used widely, in spite of potential side effects and uncertainties about their efficacy.[12]

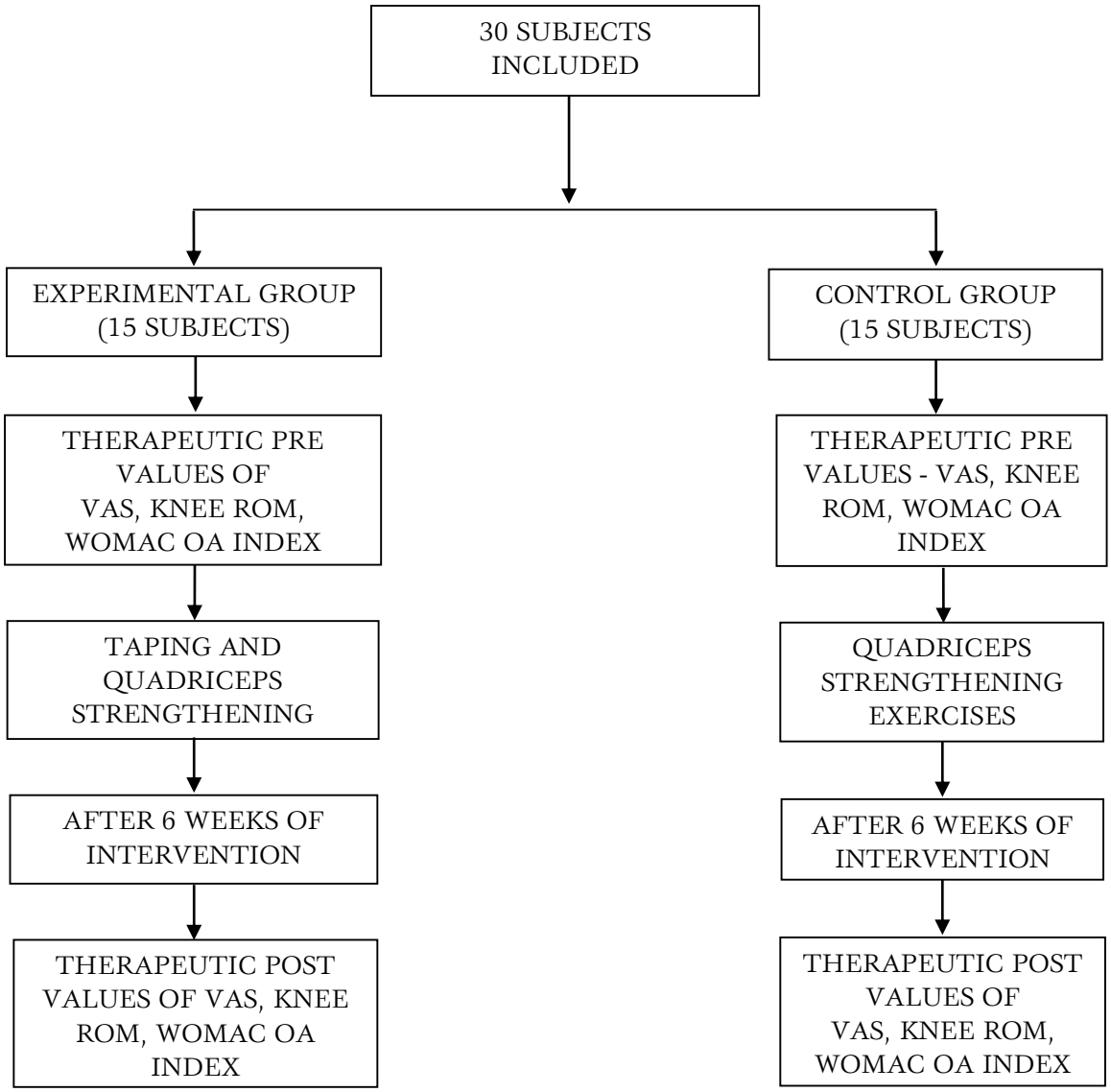
Physical therapy is playing a major role in treatment of the disease with a variety of interventions such as manual therapy techniques, electrical stimulation, modalities, balance, coordination, quadriceps strengthening exercises, functional retraining, and knee taping techniques.[13]

Presently, there are very few OA treatment strategies specifically targeting the patellofemoral joint, but patellar taping is one conservative intervention that has been recommended for treating patellofemoral joint OA.[14] Furthermore, patellar malalignment is typically observed in a lateral direction (displacement or tilt), which likely reflects the OA disease process predominantly affecting the lateral patellofemoral joint compartment.[15] The taping resulted in vastus medialis oblique (VMO) and quadriceps activation, patella alignment, and reduced pain. [16]

Knee tape is the forms of physical therapy procedures treating OA of the knee specially if patellofemoral compartment is affected and there are small numbers of studies explore the effect of knee tape on patients with OA knee. The subjects were evaluated for pain by using Visual Analogue Scale (VAS)[17], Knee flexion ROM using Goniometer[18], functional ability using WOMAC Index of Osteoarthritis.[19] Therefore the purpose of this study is to know the effects of kinesiotaping along with quadriceps strengthening in subjects with symptoms of patellofemoral osteoarthritis.

METHODOLOGY

STUDY ALGORITHM



DESIGN OVERVIEW:

This study was experimental study and samples were collected by simple random sampling.

SETTING AND PARTICIPANTS: This study was conducted in college of physiotherapy, SVIMS and BIRRD Tirupati, between August 2013 to January 2014.

Thirty subjects were randomly and divided into two groups, experimental and control group. The inclusion criteria were: All referred and pre diagnosed case of knee osteoarthritis involving patellofemoral joint, anterior- or retro-patellar knee pain aggravated by at least two activities that load the PFJ (e.g. stair ambulation, squatting and/or rising from sitting), pain during these activities, pain severity > 5 in VAS scale, females of age >45 years were taken, Patello femoral OA(Grade I and II)- according to Kellgren JH and Lawrence JS scale and written informed consent was taken from each subject. Exclusion criteria were: Patellofemoral OA (Grade 3 and 4), allergic to tape, History of joint replacement, Steroid injection/surgery of the knee, Rheumatoid arthritis and other musculoskeletal problems.

INTERVENTION: Experimental group received kinesiotaping and quadriceps strengthening exercises and Control group received quadriceps strengthening exercises.

TAPING PROCEDURE

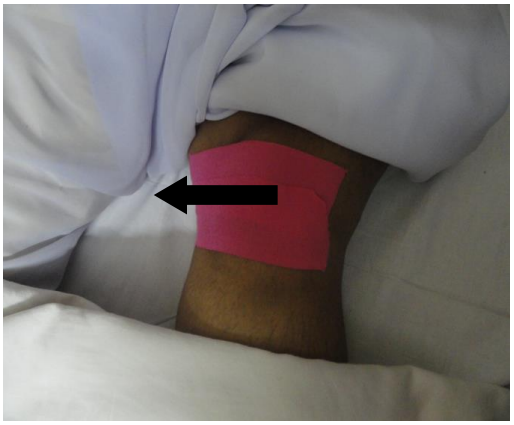
Subjects were made to lie supine with their knees extended and the quadriceps relaxed. The hair over the application area was shaved prior to tape application. Kinesiotaping was applied medially to the patella, tape provides medial glide, medial tilt and anteroposterior tilt to the patella and reduce strain on the infrapatellar pad or pes anserinus.

Medial glide technique: One end of the tape was secured to the lateral patellar border and the patella was glided medially by the use of the thumb while maintaining tension of the tape. It was

applied up to medial border of medial hamstring tendon. Medial tilt technique: The tape was secured at the middle portion of patella and then pulled medially to tilt the lateral border of patella; correcting the tilt and it was applied up to the medial border of medial hamstring tendon. In both cases the medial soft tissues were brought over the medial femoral condyle toward patella to obtain a more secure fixation. Tape was applied for 6 weeks, 3 times per week. Both the experimental and control group received quadriceps strengthening exercises.

Picture-1

Image of kinesiotaping (medial glide and medial tilt)



QUADRICEPS STRENGTHENING EXERCISES

Stretches to hamstrings, Static quadriceps isometrics, Straight leg raising(SLR).Multiple angle isometrics were done for 5 times a week for 6 weeks, each session includes 3 sets of 10 repetitions of each exercise were given.

Outcome Measures: Baseline and post intervention data (after 6 weeks) were taken by using VAS scale, Knee flexion ROM, WOMAC Index of Osteoarthritis, WOMAC Index is used to assess patients with osteoarthritis of the knee in terms of pain, stiffness, and physical function using 24 parameters where for knee possible pain score ranges from 0-20, for stiffness range 0-8 and for function 0-68. The pain, stiffness, and physical function was assed using 5 point ordinal scale (0-much improved, 1-improved, 2-no change, 3-worse, 4-much worse). Maximum total score is 96, and minimum is 0. So, higher WOMAC scores indicate poorer outcome.

STATISTICAL ANALYSIS

Statistical analysis was done using the statistical software "EXCEL, SPSS 20.0" version, for this purpose the data was entered into Microsoft excels spreadsheet, tabulated and subjected to statistical analysis.

Of the 30 subjects 15 were randomized into experimental group and 15 were randomized into control group. All the 30 subjects completed to entire protocol as defined by 6 weeks of treatment in the daily session. The outcome measures of the study were VAS, Knee FLEXION ROM, and WOMAC.

To compare both treatment effects of the parameters with in groups , paired sample t-test was used and to test the comparison between post values of experimental with control group unpaired t-test has been used.

TABLE-1

Comparison of mean difference of VAS (pain) of experimental and control groups

PARAMETER	GROUP	N	Mean difference	SD	t-value	P-value
VAS	Experimental	15	3.33	0.81	4.86	0.00
	Control	15	1.86	0.83		

Inference: It was observed that there was a statistical significance ($p < 0.05$) existing between control and experimental with respect to VAS. And also it was noticed that experimental group is found to be better with greater mean.

GRAPH -1

Mean differences of pain (VAS) of experimental and control groups

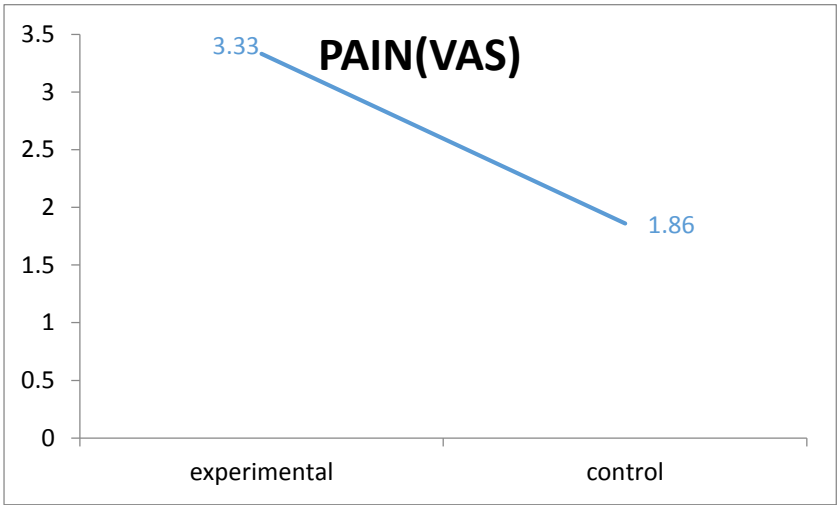


TABLE -2

Comparison of mean difference of pre &post values of knee flexion rom of experimental and control groups:

PARAMETER	GROUP	N	Mean difference	SD	t-value	P-value
KNEE ROM	Experimental	15	17.00	4.14	4.00	0.00
	Control	15	11.66	3.08		

Inference: It was observed that there was a statistical significance ($p < 0.05$) existing between control and experimental with respect to KNEE FLEXION ROM. And also it was noticed that experimental group is found to be better with greater mean.

GRAPH -2

Mean differences of knee flexion rom of experimental and control groups

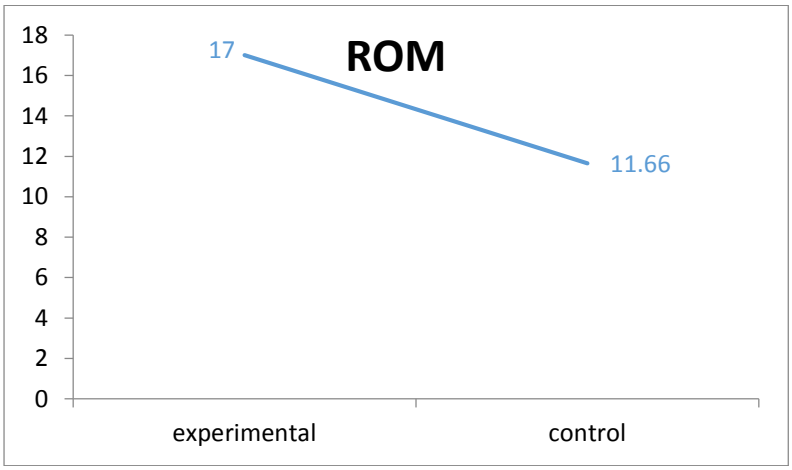


TABLE -3

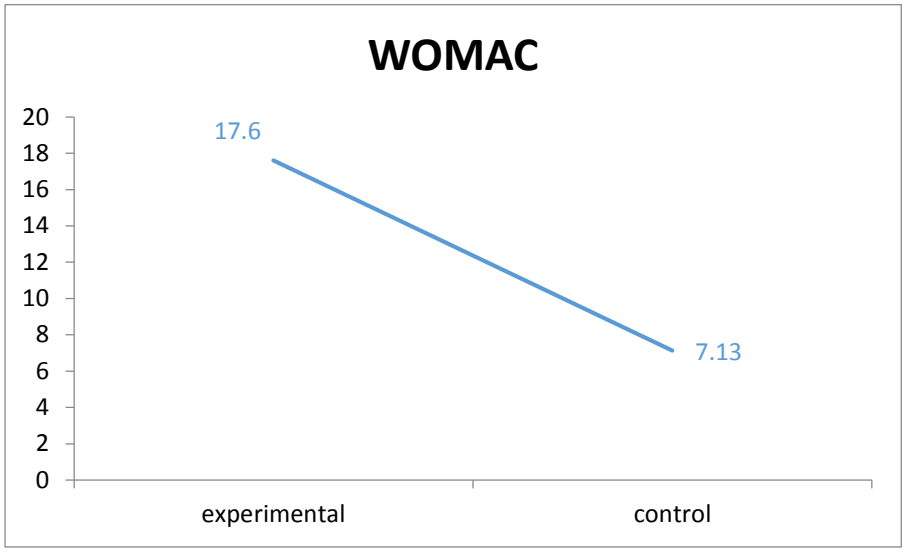
Comparison of mean difference of pre &post values womac of experimental and control groups

PARAMETER	GROUP	N	Mean difference	SD	t-value	P-value
KNEE ROM	Experimental	15	17.60	5.67	6.66	0.00
	Control	15	7.13	2.16		

Inference: It was observed that there was a statistical significance ($p < 0.05$) existing between control and experimental with respect to WOMAC. And also it was noticed that experimental group is found to be better with greater mean.

GRAPH -3

Mean differences of womac of experimental and control groups



RESULTS

The results indicated that kinesiotaping along with quadriceps strengthening exercises shows significant improvement in pain (<0.05), knee ROM (<0.05) and functional activities (<0.05) after 6 weeks compared to quadriceps strengthening exercises alone.

DISCUSSION

The present study is carried out using kinesiotaping, quadriceps strengthening exercises in subjects with patellofemoral osteoarthritis. Total number of subjects was 30; they were randomly divided into 15 in each group. In the experimental group, subjects received kinesiotaping and quadriceps strengthening exercises and in control group received quadriceps strengthening exercises. The result of the present study shows that the subjects in experimental group showed there is significant reduction in pain in terms of VAS, improvement in ROM and increase in overall function in terms of WOMAC score when compared to control group. The age group subjects included in the study was more than 45 yrs. Females were more affected than males in the age group of more than 45 yrs. The mean ages of participants in the study were of 53 years (SD $\pm$ 4.81).

Herrington proposed that patellar taping may lead to altered large fiber afferent input to the dorsal horn, decreasing the perceived pain that may be contributing to quadriceps inhibition. He also suggested that there is potential for restoration of quadriceps function through increased alpha motor neuron excitation.[20]

Hinman et al evaluated the effects of therapeutic taping of the knee improves pain and disability in patients with osteoarthritis of the knee and those benefits remain after stopping treatment. After intervention the therapeutic tape group showed a significantly greater reduction in pain (38-40%) than the control and no tape groups, This indicates a prolonged effect of therapeutic tape three weeks after stopping treatment [21]. Knee taping is believed to relieve pain by improving alignment of the patellofemoral joint and/or unloading inflamed soft tissues(infrapatellar pad).[21]

KayM.crossley found that the patella was more laterally positioned in people with patellofemoral joint OA compared with asymptomatic controls. In the patellofemoral joint OA group, standardized patellar taping resulted in an immediate reduction in lateral patellar displacement and tilt, and an immediate reduction in pain.[22]

Hicks JE conducted a study to find out the effect of exercise in patients with inflammatory arthritis and connective tissue disease and concluded that exercise programs had been shown to increase joint motion, muscle strength and endurance and should be initiated early in the course of the disease. [23]

The patellar tape used in this study also included a component designed to reduce the load on the infrapatellar fat pad. Because the infrapatellar fat pad is one of the most pain-sensitive structures in the knee and is often described as a potential source of pain in knee OA it is possible that the patellar tape may have reduced knee pain through its influence on the peripatellar soft tissue structures. [24-26]

Furthermore, cohort studies of people with knee OA have shown that a more laterally aligned patella has adverse consequences, because it is

associated with greater functional impairment[27] more severe OA (more JSN and less cartilage thickness)[28] and greater structural deterioration in the patellofemoral joint.[29] Treatments such as patellar taping that address patellar malalignment may be able to alleviate some of the physical dysfunction associated with patellofemoral joint OA and may have the potential to slow disease progression.

One potential mechanism that might account for the observed pain relief is a change in the patellofemoral joint contact area, similar to that obtained using a patellar brace by Powers and colleagues.[30]This change in patellofemoral joint contact area was associated with reduced patellofemoral joint stress, and it is feasible that patellar tape may produce a similar effect.

Changes in Electromyographic (EMG) activity of the Vastus medialis obliquus (VMO) relative to Vastus lateralis (VL) after the application of patellar tape has been reported in several studies.[31]

In the present study it is proven that supervised exercises has an immediate and significant effect on pain reduction and improvement in knee ROM and knee function. In the present study the pain is measured using Visual Analogue Scale(VAS).The subjects showed significant pain relief in both groups pre to post intervention; and post intervention at the end of 6 weeks, but when comparison was done between the groups, statistically significance difference was found between the two groups (EG = 64.16%; CG = 35.83%) in relieving pain. The knee ROM is measured using Goniometer. The subjects showed significant improvement in knee ROM in both groups pre to post intervention; and post intervention at the end of 6 weeks, but when comparison was done between the groups, statistically significance difference was found between the two groups (EG = 57.34%; CG = 42.65%) in improving the knee flexion range of motion.

In the present study WOMAC index was used to assess overall knee function since its validity and reliability is already established. WOMAC is used to assess the improvement in knee function. The subjects were assessed for the performance of daily living activities. The subjects showed significant improvement in functional activities in both groups pre to post intervention; and post intervention at the end of 6 weeks, but when comparison was done between the groups, statistically significance difference was found between the two groups (EG = 72.41%; CG = 27.58%) in improving the functional activities. kinesiotaping could be used as effective treatment for pain relief and improving in knee ROM and functional activities in patellofemoral osteoarthritis.

To test the significance of the mean difference on two groups, unpaired t-test has been utilized. It is statistically significant impact in the parameters VAS, ROM, and WOMAC. The result of the present study shows kinesiotaping along with quadriceps strengthening exercises have statistically significant impact on pain, ROM and functional activities in patellofemoral osteoarthritis.

CONCLUSION

Subjects with kinesiotaping along with quadriceps strengthening showed significant improvement in reducing pain, in improving ROM & functional activities at the end of 6 week treatment when compared to subjects with patellofemoral osteoarthritis underwent quadriceps strengthening exercises alone. Therefore, application of kinesiotape can be considered beneficial for pain relief and improvement ROM, functional activities in subjects with patellofemoral joint osteoarthritis.

LIMITATIONS AND RECOMMENDATIONS

1. Small sample size
2. Subjects could not be followed up after the study.
3. Duration of the study was short.
4. Activity level of subjects was not taken into consideration.
5. Studies with longer duration are recommended with longer follow-up period to assess long term benefits.
6. Conduct the study with larger sample size.
7. Further studies can be done with same protocol in male subjects.
8. Further studies can be done with different grades of osteoarthritis.

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