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RESEARCH ARTICLE

EFFECTIVENESS OF THERAPEUTIC EXERCISES ON PAIN, QUALITY OF LIFE AND MOBILITY AMONG MIDDLE AGED PATIENTS WITH KNEE OSTEOARTHRITIS

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ABSTRACT

Osteoarthritis of the knee is a common cause of pain, reduced mobility and quality of life (QOL) in adults. People with knee osteoarthritis experience restricted participation in activities and behaviors of their choice, and thus it affects their social life. Given the increasing incidence of symptomatic knee Osteoarthritis and the role of non-pharmacological interventions in mitigating symptoms, it is important to find low-cost, easy to administer interventions. The purpose of this study was to investigate the effect of therapeutic exercises on knee related pain, QOL and mobility by following KOOS, timed up and go test. The results of the present study imply that therapeutic exercises that included warm-up, active range of motion exercise, strengthening exercise, muscle stretching and cool down were effective over conventional therapies that included hot packs and isometric quadriceps exercise in improving the knee related pain, QOL and mobility of middle aged adults with knee osteoarthritis.

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INTRODUCTION

Knee osteoarthritis (OA)is a most common type of arthritis, which causes chronic musculoskeletal pain and problem in mobility of the individual. Therefore, it imposes a major burden on healthcare provision. Risk factors associated with the knee OA includes female sex, older age, obesity, osteoporosis, sports activities, history of trauma, muscle weakness or dysfunction and genetic factors (Bosomworth, 2009). OA is most often considered as a disease of old age peoples; ironically, knee OA is evident in young age peoples. Around 5% of population in the age of 35 to 54 years was found to possess radiographic signs of knee OA, wherein majority of these individuals were found to have previous history of knee injury (Roos, 2005). The symptoms that demarcates knee OA includes pain, joint stiffness, decreased or loss of function of muscle strength. Walking, climbing stairs, rising from chair are the most common difficulties faced by people with knee OA and thus these are the important components of physical rehabilitation for people with knee OA (Creamer *et al*., 2000). Treatment of knee OA can be classified into four main categories: non-pharmacologic, pharmacologic, complementary and alternative, and surgical. Generally, treatment of knee OA begins with the least expensive and safest therapies before proceeding to more expensive and invasive therapies (Iwamoto *et al*., 2011). Exercise has been shown to be an effective non-pharmacologic first line treatment for patients with knee OA which significantly reduces pain and disability (Sinusas 2012). However, there is a need to identify improved therapeutic exercises to decrease the joint pain more significantly and to increase the musculature strength surrounding the knee joint. Previous studies have demonstrated that exercise, low-level laser, acupuncture and transcutaneous electrical nerve stimulation effectively reduced the pain and improved the function in patients with knee OA (Iwamoto *et al*., 2011). The present study aims to examine the effectiveness of the therapeutic exercises that includes warm-up, active range of motion exercise, strengthening exercise, muscle stretching and cool down on middle aged patients with knee OA as compared to the patients undergoing conventional hot packs and isometric quadriceps exercise.

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MATERIALS AND METHODS

Experimental design

Ethical approval of the study was obtained from the University Ethical Committee in 2012, before the commencement of the study (Ethical clearance number:Ph.D08/50163/2012). Patients were recruited from the hospital outpatient clinic of Physical and Medicine Rehabilitation Centre, Puducherry;they were then explained about the procedure of the study. A written informed consent was obtained from all the patients before their participation in the study. The subjects (age group 50-65 years) with knee OA were selected (n =124) and randomly allocated into two groups: Therapeutic exercise group (Group I), and control group (Group II). The duration of training was four weeks, three times per week.

The inclusion criteria included

- Subjects of diagnosed unilateral knee osteoarthritis, based on the American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the knee
- **Pain for at least** 3 of 6 months prior to the treatment, Age> 50-60 years, stiffness < 30 minutes, crepitus, bony tenderness, bony enlargement and no palpable warmth (Altman *et al*., 1986)
- Sufficient English/Tamil language skills to understand and complete the assessment tools

The exclusion criteria included

Subjects were excluded from the study if they had any of the following:

- Severe knee osteoarthritis grade 4, according to Kellegran-Lawrence classification
- Secondary knee osteoarthritis involving ailment issues like Gout, Rheumatoid arthritis, Septic arthritis, and Trauma
- Presence of a neurological disease
- Haemophilic joints
- Uncontrolled low or high blood pressure
- Uncontrolled cardiopulmonary or respiratory condition
- Difficulty in rising from and returning to a chair without any support
- Any additional musculoskeletal diseases or surgeries
- Subjects who were already practicing yoga for a month or more
- Known psychiatric illness
- Inability to co-operate

Procedure for intervention

Patients with knee OA were selected, and therapeutic exercises that included warm-up, active range of motion exercise, strengthening exercise, muscle stretching and cool down along with Hot packs were applied to patients in therapeutic exercise group and patients in the control group received hot packs and isometric quadriceps exercise as conventional physiotherapy.

Evaluation procedures

Measures for pain, quality of life (QOL) and mobility were considered for outcome analysis. There were3 dropouts in each group during the intervention period and final analysis was done for 118 participants. Pre-test and after 4-week post-test measurements were taken using KOOS, timed up and go test.

Statistical analysis

Descriptive statistics, including means, standard deviations were calculated for all variables. Statistical analyses were conducted using SPSS software (version 17.0) and significance was set at 0.001. Parametric tests were used to analyze the scores. Independent t-tests were performed to compare baseline statistics between randomized groups. To find the difference between the intervention groups post test and baseline reading Independent 't' test and within the group to know the difference between pre and post intervention paired 't' test was used.

RESULTS

One hundred and twenty four patients with knee OA were randomly classified into two equal groups. Table 1 shows the demographic characters of the patients involved in this study.

Table 1. Demographic characteristics of therapeutic exercise and control group

Variables	Therapeutic Exercise		Control	
	f	%	f	%
50-55	29	49.2	25	42.4
56-60	23	39	18	30.5
61-65	7	11.9	16	27.1
Male	28	47.5	19	32.2
Female	31	52.5	40	67.8
House Wives	26	44.1	36	61
Workers	28	47.5	20	33.9
Retired	5	8.4	3	5.08
18.6-24	12	20.3	11	18.6
25-29	23	39	31	52.5
≥30	24	40.7	17	28.8
Right	27	45.8	33	55.9
Left	32	54.2	26	44.06
Medial	27	45.8	23	39
Lateral	8	13.6	7	11.9
General	24	40.7	29	49.2
Intermittent	33	55.9	41	69.5
Constant	26	44.1	18	30.5
3-6	38	64.4	31	52.54
7-12	21	35.6	28	47.45
High School	39	66.1	44	74.6
Secondary	9	15.3	2	3.4
Graduate	11	18.6	13	22

Effect of therapeutic exercises on pain and QOL: results of pre- and post test

Table 2 shows the results of pain and QOL score for therapeutic and control groups in pre- and post-tests. A significant improvement of pain intensity and QOL was evidenced in both groups after respective treatments. The pain score for group I was found to be 41.378±12.073 in the pre-test and which improved to 69.694±12.507 in the post-test. In contrast, pain score for group II was found to be 40.672±6.968 in the pre-test and 38.323±7.746in the post-test. On the other hand, the QOL score for group I and group II was found to be 39.82±13.01 and 38.78±7.71in the pre-test, respectively. Whereas after respective exercises, the score for post-test was found to be 62.85±13.48 and 36.49±6.65, respectively in group I and group II.

Table 2. Comparison of Mean physical disability- Pain, QOL Scores for Therapeutic and control groups in pre and post tests

		Therapeutic	Yoga	Control
Pain	Pre	41.378±12.073	41.515±7.825	40.672±6.968
	Post	69.694±12.507	46.554±11.559	38.323±7.746
QOL	Pre	39.82±13.01	37.12±7.25	38.78±7.71
	Post	62.85±13.48	48.21±11.12	36.49±6.65

Table 3. Paired difference for KOOSpre- and post-test scores in the therapeutic exercise and control groups

	Parameters	Pre-test	Post-test	Paired difference	't' value	p value
Therapeutic group	Pain	41.378 ± 12.013	69.694 ± 12.507	-28.315±14.610	14.886	<0.01
	QOL	37.605±14.838	62.809±14.423	-25.203±18.993	10.193	<0.001***
	Pain	40.672±6.968	38.323±7.746	2.349±9.582	1.883	0.064
Control Group	QOL	40.042±11.728	33.161±11.018	6.881±9.319	5.672	0.001

Note: *p<0.05, **p<0.01, ***p<0.001, NS- Not significant (p>0.05)

Table 4. Effect size among groups on Pain, QOL subscales scores of KOOS

		N	Effect size	Remark
Control group	Pain	59	.3132	Small effect
	QOL	59	.3249	Small effect
Therapeutic exercise group	Pain	59	2.3209	Very large effect
	QOL	59	1.6978	Very large effect

Table 5. Comparison of mean pre-test and post-test mobility scores (TUG) in three groups by 't' test

	Groups	pre-test	post-test	Paired difference	't' value	p value
TUG	Therapeutic group(n=59)	13.068±2.70	11.305±2.660	1.763±1.321	9.891	p<0.001
	Control(n=60)	12.899±1.045	13.237±1.546	0.339±1.321	-1.971	0.068 NS

Results of paired difference for KOOSpre- and post test

Table 3, Figure 1 and 2 shows the paired difference for KOOS pre- and post-test scores (pain and QOL) in the therapeutic exercise and control groups. A significant (p<0.01) increase in the score was observed in the post-test of therapeutic exercise group as compared to pre-test. In contrast, there was no significant difference between post-test and pre-test in the control group for any of the tested parameters.

Results of effect size among groups on pain, QOL subscales scores of KOOS

Table 4 shows the results of subscale scores of KOOS for effect size among the therapeutic exercise and control group. It is clearly evident that the therapeutic exercise group had the largest effect size for both pain (2.3209) and QOL (1.6978). Whereas, the control group had smallest effect size on pain (0.3132) and QOL (0.3249).

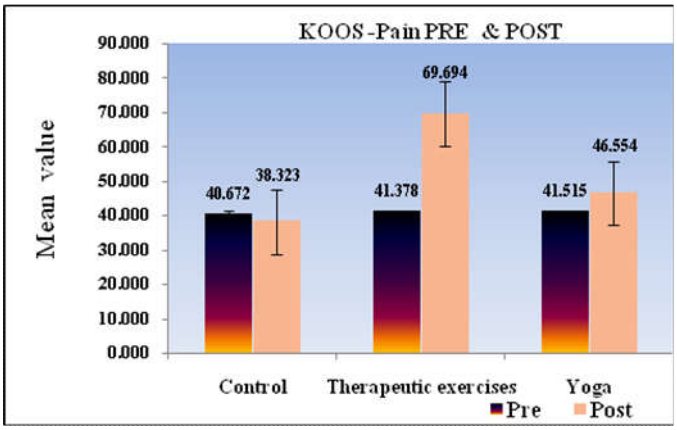

Figure 1. KOOS test for pain (pre- and post analysis)

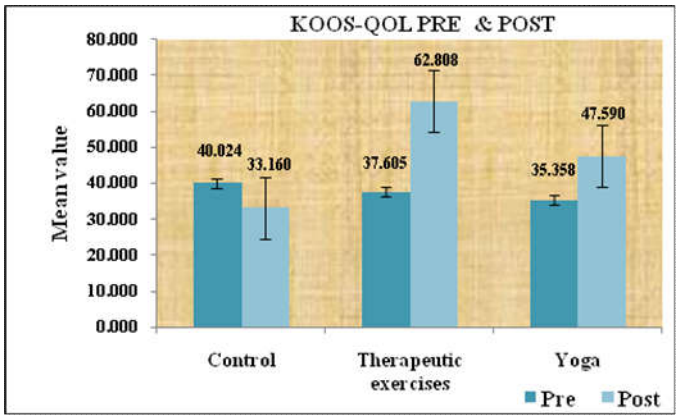

Figure 2. KOOS test for QOL (pre- and post analysis)

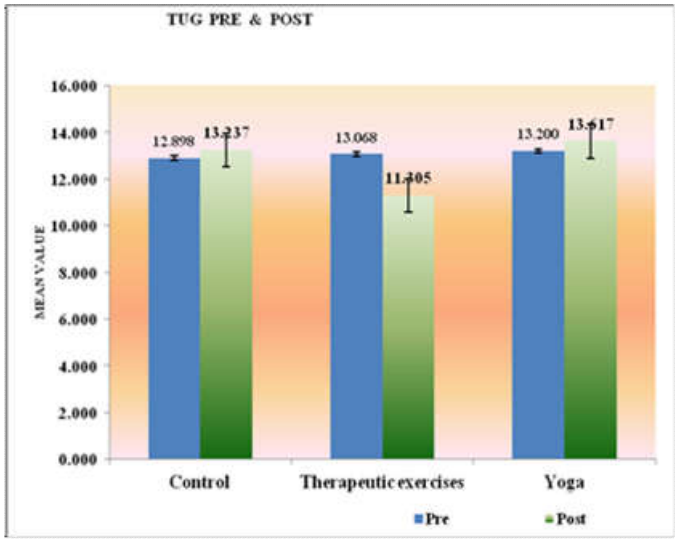

Figure 3. Knee mobility of subjects assessed by TUG

Knee mobility of subjects as measured by TUG

Table 5 and Figure 3 shows the mobility of the subjects, which was measured by TUG. A significant ($p<0.001$) difference between the post-test (11.305±2.660) and pre-test (13.068±2.70) was observed in the therapeutic exercise group. Whereas, there no significant difference in the control group.

DISCUSSION

The primary aim of any intervention method to manage OA of the knee is to relieve the patient from pain. In addition, that should also improve the QOL of the subject by maintaining or improving the mobility and minimizing the disability (Jamtvedt *et al*., 2008). The present study investigated whether, therapeutic exercises for 4 week was more effective in treating the knee OA in middle aged subjects. To assess the outcome of the study, two important parameter, pain and QOL was studied. These two factors were selected, since pain and disability is the common feature in the knee OA patients (Huang *et al*., 2003). In general, any rehabilitation program should have positive effect on functional capacity, pain and sensoriomotor function (Roddy *et al*., 2005). Accordingly, the present study utilized the therapeutic exercises such as warm-up, active range of motion exercise, strengthening exercise, muscle stretching and cool down and these exercises were found to have a great impact in reducing the pain of knee OA patients and to improve their QOL. The findings of this study clearly showed a significant effect on pain reduction and improvement in QOL as measured by TUG analysis after treatment with therapeutic exercises. The TUG value for therapeutic exercise group was found to significantly reduced from 13.068±2.70 to 11.305±2.660 ($p<0.001$) upon invention. These results were found to be in agreement with several previous reports, where active and passive range of motion exercises was found to be an important part of rehabilitation programs to help the patients with knee OA to regain the joint mobility and function (Deyle *et al*., 2000).

In addition, KOOS analysis showed a significant difference in all dimensions between the therapeutic exercise and control group, which implies that self reported physical disability was reduced upon undergoing therapeutic exercises. Recently, Hung *et al*., have reported that therapeutic exercises have strengthened and walking stability of the knee OA patients (Huang *et al*., 2003). Further, in support for the present study, the results of the Puett and Griffin review on 15 controlled trails of non-invasive and non-medicinal therapies, which showed that exercises found to reduce the pain and the improved the function in patients with knee OA (Puett *et al*., 1994). To conclude, the results of the present study clearly suggests that, the therapeutic exercises which includes warm-up, active range of motion exercise, strengthening exercise, muscle stretching and cool down are effective over conventional therapies that included hot packs and isometric quadriceps exercise in improving the knee related pain, QOL and mobility of middle aged adults with knee osteoarthritis.

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