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Effectiveness of Core Strength Exercise in Patient with Primary Osteoarthritis of Knee

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ABSTRACT

BACKGROUND: Osteoarthritis (OA) is the most common degenerative, progressive musculoskeletal condition that can affect joints, but it mainly affects the hips and knees, which are predominant weight-bearing joints. Osteoarthritis is associated with significant pain, and it limits mobility, basic daily activities, and quality of life. Core stability exercise activities will help maintain good posture in motion and be the basis for all movements of the arms and legs. The core controls trunk position and pelvis-related movement, optimizing the production, transfer, and control of force and motion to the distal segments of the kinetic chain.

OBJECTIVE: The study aims to find out the effectiveness of core strength exercise in patients with primary osteoarthritis of the knee.

METHODOLOGY: It is a quasi-experimental study consisting of 43 knee osteoarthritis patients. They are divided into an exercise group and a control group, in which each group comprises of group A 22 and group B 21patients. The Core muscle strengthening exercises and IFT were given to the experimental group, and knee strengthening exercises and IFT for the control group.

OUTCOME MEASURES: The Numeric pain rating scale is used for pain, and the WOMAC questionnaire for quality of life.

RESULTS: The pre and post mean values of group A for NPRS is 6.68 and 4.95, and Western Ontario and McMaster Universities Arthritis Questionnaire is 57.04 and 46.09, The pre and post mean values of group B for NPRS were 6.95 and 2.85, and Western Ontario and McMaster Universities Arthritis Questionnaire were 56.15 and 45.20.

CONCLUSION: The study concludes that there is a statistical improvement in NPRS, and no statistical significance is noted in the WOMAC questionnaire.

KEYWORDS: Knee osteoarthritis, Core strengthening, knee strengthening and Primary Osteoarthritis.

INTRODUCTION

Osteoarthritis (OA) is a non-inflammatory joint degenerative condition characterized by specific and progressive deterioration of the entire structure, which includes hyaline cartilages, soft tissue structure in and around the joint, production of osteophytes, and bony sclerosis.[1,2]

The pathology underneath osteoarthritis is the wear and tear mechanism. The weight distribution of the knee joint is more than the other joint and this results in more prevalence of osteoarthritis than other structures[3,4]. Knee osteoarthritis is a more prevalent and disabling condition that commonly begins at the

age of 40 years and it is typically a progressive disease. The symptoms may vary for each individual due to age as well as wear and tear[5].

Primary knee osteoarthritis is idiopathic, though the cause is unknown; genetic variants, age- related physiological adaptations, ethnic background, and biomechanical factors are likely to play a role in it.[6,7] Studies have shown that people with OA knee usually have less capacity to produce force in quadriceps muscle because it easily goes to muscle atrophy and muscular inhibition, similarly the agonist muscle (hamstring) has the capacity to easily goes to tightness it resulting in disabling[8,9,10].

Biomechanical factors appear to have a key role in the progression of OA because it reduces the strength of the muscles that stabilize the knee joint[11]. Various exercise programs were used to improve functional performance and reduce the activity limitation and prevent the disabling conditions but this research paper mainly concentrates on core strengthening exercises for patients with primary osteoarthritis[12,13,14].

Knee osteoarthritis has been linked to muscular atrophy and loss of strength in the muscles that stabilize the joint. By stimulating the Lumbo pelvic-hip complex and the per articular muscles of the knee, core stability exercise can enhance trunk, pelvic, hip, and knee coordination and stability[15,16,17,18,19].

Core muscle stability involves almost all extremity activities and functional abilities. The correlation between core muscle strength and knee stability is strongly interlinked. It also ensures that the weight and stress on the auxiliary structures is distributed properly [20].

D Maryama AD et al., (2018) stated that the core strength and hip strength plays a significant role in knee joint stability, the complete training regimen focuses on strengthening core, hip stability and must be appropriate for the treatment of OA knee.[11]

The activation of core muscle will help in improve muscle performance. The trunk will be supported by the coordinated and contemporaneous contractions of this core muscle, which will lessen the strain of the lumbar muscles and lower extremity, resulting in less damage to the surrounding tissue and reduced aberrant lumbar muscle tension.[21,22] Core strengthening exercises aim to develop muscle strength, improve posture, reduce pain, and improve the patient's ability and functional mobility[23]. Core strengthening exercises have a direct and indirect association with hip, knee and ankle strengthening.

MATERIALS AND METHODS

Individuals aged 40 years and above, of both male and female genders, with a Body Mass Index (BMI) of 30 or higher, and diagnosed with unilateral knee osteoarthritis who experienced pain over the affected knee joint were included in the study. Individuals with a recent fracture, recent history of knee dislocation or hip osteoarthritis, a history of lower limb joint replacement or spine surgery, or lower limb surgery within the past 6 months, or those who received a corticoid injection within the last month were excluded.

Study design and setting

This quasi-experimental, pre- and post-test study, utilized convenient sampling of 43 subjects was conducted over an 8-week period from SRM Medical College Hospital and Research Center.

Participants and recruitment

Participants were selected based on the inclusion and exclusion criteria and informed consent was obtained after a detailed explanation of procedure. The purpose of the study, procedure, risk factors, benefits, right to withdrawal, and assurance that the information will be maintained confidentially was thoroughly explained to the participants and their consent was obtained prior to the procedure.

Participants were randomly allocated into group A (n=22) treated with knee strengthening exercises along with interferential therapy and group B (n=21) treated with the core strengthening, and knee strengthening

exercises along with interferential therapy. Pre and post-test values of pain were assessed and recorded by using NPRS (Numeric Pain Rating Scale) and WOMAC (Western Ontario and McMaster Arthritis Index). DemoBAR DIAGRAMic data along with NPRS and WOMAC scores was taken every 2 weeks of the intervention program.

TREATMENT PROTOCOL:

Group 'A' (Control group) - Conventional physiotherapy was given to the subject. The exercise includes (Heel slides, Static quadriceps exercise, and straight leg raising) which was performed by the subject

INTERFERENTIAL THERAPY:

Duration: 15minutes Intensity: 80-120Hz Base Frequency:50Hz
Spectrum: 90Hz
Method of application: 4pole method

GROUP 'B' (EXPERIMENTAL GROUP):

In this group subject received knee strengthening exercises (Heel slides, Static quadriceps exercise, and straight leg rising), core strengthening exercise (Cross curl up, Bird dog, Bridging, Leg lift &Front plank) along with interferential therapy.

DATA ANALYSIS

The collected data were analyzed using the IBM Statistical Package software for Social Science (SPSS) version 20.0 to assess all parameters of the descriptive statistics, mean and standard deviation in the pre and post-test values in control group and experimental group.

TABLE 1

Pre and post mean values of numeric pain rating scale and WOMAC score of group a (control group)

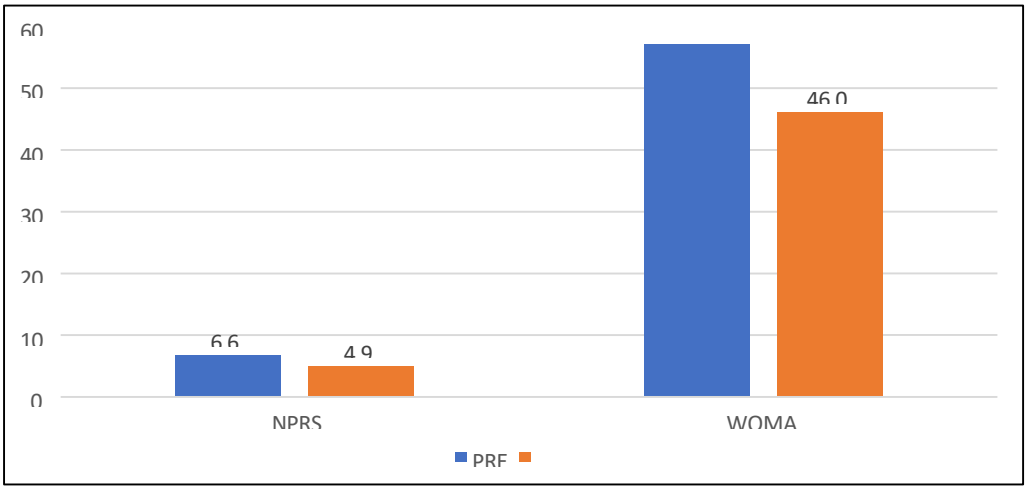
Group A		**Mean**	**Standard deviation**	**t value**	**p value**
NPRS	Pre test	6.68	0.89	14.717	0.001
	Post test	4.95	0.99		
WOMAC	Pre test	57.04	13.03	14.86	0.001
	Post test	46.09	11.21		

Table 1 shows the pre and post-test mean value, standard deviation, t-value and significant p values of Numeric pain rating scale and WOMAC questionnaire of Group A(Control Group).

According to the Table 1, there is significant reduction in pre and post test values of NPRS and WOMAC in Group A with significant value $p < 0.05$.

BAR DIAGRAM 1

Pre and post mean values of numeric pain rating scale and WOMAC score of group a



TABEL 2 Pre and post mean values of numeric pain rating scale and WOMAC score of group B (experimental group)

Group A		Standard deviation	t value	p value
NPRS	Pre test	0.99	33.18	0.00
	Post test	1.03		
WOMAC	Pre test	12.87	35.11	0.00
	Post test	12.89		

Table 2 shows the pre and post-test mean value, standard deviation, t-value and significant p values of Numeric pain rating scale and WOMAC questionnaire of Group B (Experimental Group)

According to the table 2, there is significant reduction in pre and post test values of NPRS and WOMAC in group B with significant value $p < 0.05$

BAR DIAGRAM 2

Pre and post mean values of numeric pain rating scale and WOMAC score of Group B

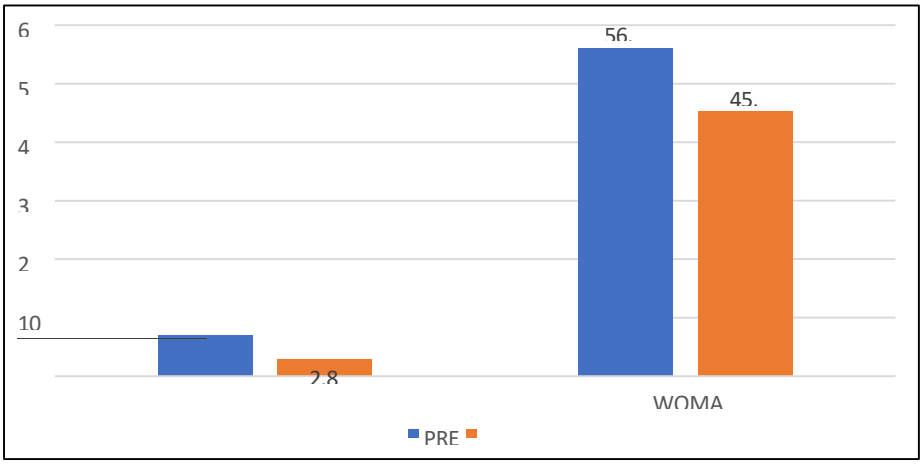
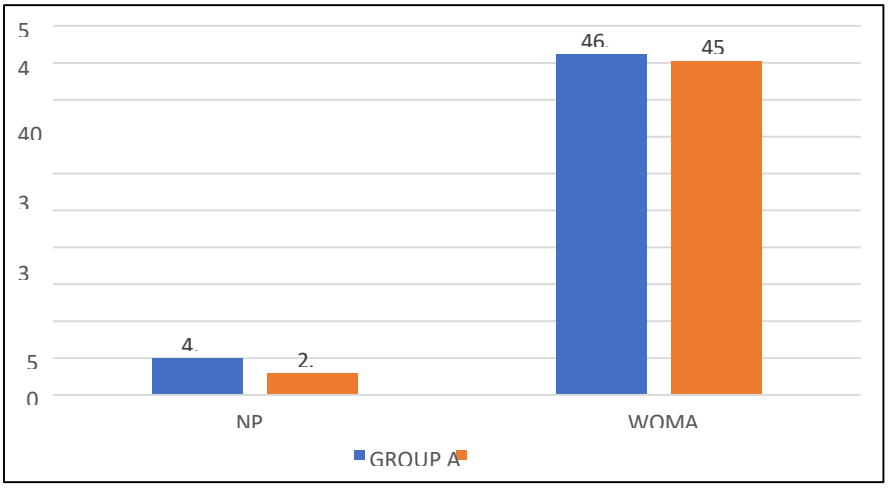


TABLE 3 Comparison of post test values NPRS, WOMAC of Group A & Group B

Parameter	Post Test Values				't' test	Significance
	Group A		Group B			
	Mean	Standard deviation	Mean	Standard deviation		
NPRS	4.95	0.99	2.85	1.03	6.68	0.000
WOMAC	46.09	11.21	45.20	12.89	0.23	0.812

According to table 3, there is significant difference in post test value of NPRS of Group A and group B, but there is no significant difference in post test value of WOMAC in group A and group B.

BAR DIAGRAM 3 Comparison of post test values of NPRS and WOMAC between Group A & Group B



RESULTS

According to table 1 and bar diagram 1 The pre and post mean values of NPRS were 6.68 and 4.95and Western Ontario and McMaster Universities Arthritis Questionnaire were 57.04and 46.09respectively.The result shows statistically significant difference between pre and post-test mean values of numeric pain rating scale and Western Ontario and McMaster Universities Arthritis questionnaire of Group A (Exercise Group) at $p<0.05$.

According to table 2 and bar diagram 2 The pre and post mean values of NPRS were 6.95 and2.85 Western Ontario and McMaster Universities Arthritis Questionnaire were 56.15 and 45.20respectively.The result shows statistically significant difference between pre and post-test mean values of numeric pain rating scale and Western Ontario and McMaster Universities Arthritis questionnaire of Group B (Control Group) at $p<0.05$.

According to table 3 and bar diagram 3 The post-test mean values of NPRS were 4.95 and 2.85, WOMAC were 46.09 and 45.20 for group A and group B respectively.According to table 3, there is significant difference in post test value of NPRS of Group A and group B, but there is no significant difference in post test value of WOMAC in group A and group B.

DISCUSSION

This study was conducted to find the effectiveness of core strengthening exercise in patient with primary knee osteoarthritis. Studies states that there is influence of bilateral and unilateral Osteoarthritis of knee in terms of function. The incidence of OA knee is increasing more due to the aging population as well as sedentary lifestyle.

The underlying mechanism of osteoarthritis is worn and tear mechanism, metabolic changes, physiological and biomechanical changes. The structure in and around the knee joint were engaged and impaired muscle function, stress loading and high use which results progressive degeneration of the joint[24,25].

The OA knee patient presented with impaired muscle function, reduced strength and inability to generate the force to maintain the joint stability. The weakness of the major muscle groups was observed in OA knee patients

Many studies report that core muscle strength was interconnected with the knee joint stability, Considering the strength deficits in the core muscles which cause improper weight distribution eventually it causes damage to the distal segments[26]. These muscles play important role in maintaining the good posture, proper weight shifting and knee joint stability.

These changes help to maintain the biomechanical properties of the structures thereby it reduced stress to the other structures. The strength of the muscles was enhanced by combining a higher volume of exercise during the intervention period with regular muscle overloading at an appropriate intensity[27,28]. The increase in muscular stress associated with high-intensity muscular contractions could be the trigger for the formation of new myofibrils, and hence the increase in muscle mass and strength that happens with exercise.

The muscle strength was obtained on the basis of structural changes such as increased muscle cell numbers, increased muscle diameter and increased in fiber length. Muscle growth and strength are aided by all three of these methods.

The subjects who treated with knee strengthening exercise program along with interferential therapy also shown changes in their pain intensity, functional activities as well as knee range of motion but it was less comparatively than the core strengthening exercise group. The knee strengthening exercise mainly concentrated on knee flexors and extensors group which control the knee joint stability rather than the entire muscle group of the lower extremities. And we found that there was significant difference but it was statistically less significant than the core strengthening exercise group.

The home exercise program was instructed to the patient due to the lack of regular supervision of exercise the patient showed less changes in their functional outcome. The future studies are recommended for supervised exercise to obtain the accurate changes in their performance.

The study shows improvement in NPRS and WOMAC questionnaire in both groups after 8 weeks intervention of core strengthening exercises and knee strength exercises but when analysis done between two groups there is significant reduction in pain among core strengthening group reduction when there is no significant difference in functional activity between control and experimental group.

CONCLUSION

This study concluded that there was a significant difference between experimental groups and control group regarding pain and functional performance. But there was statistically less significant difference in functional performance based on the WOMAC questionnaire. It seemed that core strengthening exercise training is more effective than the knee strengthening alone to improve pain and functional performance

in patient with primary osteoarthritis

LIMITATION AND RECOMMENDATIONS

LIMITATIONS

Limited study duration

The subjects with bilateral involvement were not included

The small sample size could have reduced the statistical power of the study, potentially hindering the detection of subtle but significant effects.

RECOMMENDATIONS

Longitudinal designs to observe the long-term effects and potential evolution of the observed phenomena.

Impact of Interventions on Bilateral Involvement

Explore the influence of varying severity levels in both unilateral and bilateral cases

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