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RESEARCH ARTICLE

TO ANALYSE THE EFFECT OF COMBINING HIP MUSCLE ALONG WITH QUADRICEPS STRENGTHENING & GENDER DIFFERENCE IN UNILATERAL OSTEOARTHRITIS KNEE REHABILITATION

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ABSTRACT

Objective of the study: The purpose of study is to compare the effects of strengthening the quadriceps combined with strengthening of hip muscles (hamstring, adductors, abductors, extensors) in unilateral OA knee. To compare the gender difference in the rehabilitation protocol of OA knee.

Background of the study: Quadriceps weakness is one of the most common and disabling impairments seen in individuals with knee osteoarthritis. Sufficient quadriceps and hip muscles strengthening in both isometric and dynamic strengthening are essential for undertaking basic activities of daily living. Strengthening of the leg muscles in OA patient will help them to have a better balance and stance during the gait cycle.

Methodology: 40 subjects were included based on the inclusion criteria out of 60 volunteers, 20(A) male and 20(B) female were randomly assigned to two equal groups10 in each (A1, A2, B1, B2). A1 and B1 will receive the quadriceps strengthening along with SWD. A2 and B2 will receive the quadriceps strengthening & hip muscles strengthening along with SWD. Pre and post test were done using WOMAC scale.

Result: On comparing the mean values of all the four groups quadriceps and hip muscle strengthening, shows significant reduction in the post –test mean but(sub Group A2 in Group A) shows (47.59) lower mean value is more effective than other three groups at $p \leq 0.005$.Hence null hypothesis rejected and alternate hypothesis accepted.

Conclusion: The study showed that there is significant difference in the post test values of quadriceps strengthening along with hip muscles strengthening more for males than females in OA patients of six week study. Group A sub division A2 showed more significant difference than the group B. Hence alternate hypothesis is accepted.

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INTRODUCTION

Osteoarthritis is a chronic degenerative condition of the joint. It is a chronic condition resulting in pain, fatigue, functional limitations, increased healthcare utilization and high economic costs to society. (Litwic *et al*., 2013) OA is regarded as a whole joint disease with a multifactorial etiology, including increased mechanical stress, ligament derangements, cartilage degradation subchondral bone changes and muscular impairment. (Cartan *et al*., 2013) The predominant structural changes are the loss of cartilage and the formation of osteophytes. These changes are easily demonstrated radio graphically, and objective measures of disease severity are based on the amount of joint space loss (a reflection of cartilage loss) and the presence of osteophytes. (Kellgren and Lawrence, 1957) Furthermore, the subchondral bone scleroses in the early phases of OA and this process, possibly involving micro fractures has been suggested to be pathogenetic factors in the process of cartilage degeneration. (Burr and Radin, 2003) Articular and periarticular changes like synovial hyperplasia and joint effusion. It is most common in weight bearing joints. Epidemiological studies estimate around 43 million affected patients in the United States alone and about 15% of the world population. (Egloff *et al*., 2012) The prevalence of OA related disability is greater among women than among men. (Highgenboten *et al*., 1988) Thus arthritis is a major health problem for women. (Sowers *et al*., 2011; Felson *et al*., 1987) The burden of OA is projected to increase, due in part to obesity and aging population. (Nguyen *et al*., 2011) While the prevalence of OA increases with age. (Losina *et al*., 2013) Biomechanically, the knee joint bears higher shear forces than

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the hip or ankle joint as it incorporates sliding, rotating and rolling motions during movements. In early changes of osteoarthritis, the bone density of the subchondralbone is reduced. Cartilage and bone in the knee joint receive and dissipate contact loads associated with movements and weight bearing, and are therefore continuously challenged biomechanically. (Rajalaxmi *et al*., 2016) Knee OA affects the kinetics and kinematics of the knee joint. These biomechanical changes are the primary source for pain and functional limitation and therefore preventing their progression is critical in the management of knee OA. Due to the well-established evidence on the effect of biomechanical factors on knee OA, there is a growing experimental and developmental effort in finding on adequate biomechanical intervention for knee OA.

Patients with knee OA tend to have reduced muscle strength as a consequence of reductions in physical activity and pain inhibition. (Alnahdi *et al*., 2012) As the quadriceps mechanism is of key importance in walking, standing and using stairs. Muscle weakness may be direct cause of limited movement, increase the chance of falling and lead to poorer dynamic balance in knee osteoarthritis patients. (Rubenstein, 2006) Muscle strength testing has revealed that those with knee OA have a 25% to 45% loss of knee extension strength and a 19% to 25% loss of knee flexion strength, compared with similarly aged controls. (Pap *et al*., 2004) Osteoarthritis knee affects the hamstring muscle more than quadriceps muscle, therefore there is a need for physiotherapist who have concentrated almost exclusively on quadriceps strengthening in osteoarthritis patients to include hamstring strengthening in their management protocol. Many exercise are said to be effective including open kinematic and closed kinematic exercise (Rajalaxmi *et al*., 2016), retro walking in treadmill on pain and disability (Hardik Anadkat *et al*., 2015), strengthening the hamstring muscle has been found to enhance the functional ability of the deficient knee. (Highgenboten *et al*., 1988) Western Ontario and McMaster universities (WOMAC) osteoarthritis (OA) index is a tested questionnaire to assess symptoms and physical and functional disability in patients with OA of the knee. The reliability in terms of internal consistency of the WOMAC subscales (pain, stiffness and function).

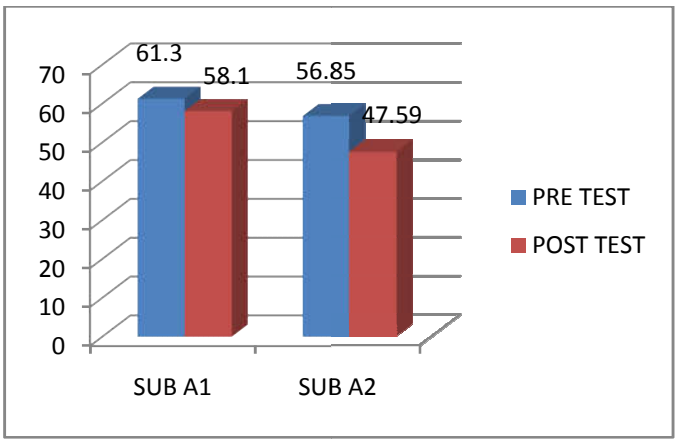
MATERIALS AND METHODS

Once the study is approved by the institutional review board,70 volunteers with OA knee were recruited for the study out of which a total of 40 subjects (20 male and 20 female) were selected based on the inclusion criteria subjects between the age group of 40-60 years, both male and female, subjects with Grade 2 OA, BMI of between 25 to 35 and VAS score between 4 to 7were included for the study. Excluded those with Rheumatoid arthritis, Joint replacement in both knees, Tumors, Un co-operative patients, epileptic patients, Arterial disease. The subjects were fully explained about the study and asked to fill the consent form in acceptance with participation of the study which is duly signed by the participant and the researcher. Age, Sex, Height, Weight, were recorded prior to the Pre-Test.out of 40 subjects included 20 male and 20 female were randomly assigned in to 2 equal groups. Group A consists of 2 subdivisions of "A1" (10 male) and "A2" (10 male), similarly Group B consists of 2 sub group of "B1" (10 female) and "B2 (10 female). Sub group "A1"and "B1" will receive the quadriceps strengthening (*Quad Clenches*, *Short Arcs, Long Arcs, Knee Marching, Hamstring stretch)* along with SWD. Sub group A2 and B2 will receive the quadriceps strengthening (*Quad Clenches*, *Short Arcs, Long Arcs, Knee Marching, Hamstring stretch)* & hip muscles strengthening (*Buttock Kicks, Buttock Clenches, Pillow clench (adductors), Side leg raise (abductors), Hamstring stretch)* along with SWD. Pre test was done using WOMAC scale (western Ontario and McMaster Universities osteoarthritis index) exercise were done for 2 sessions /day for 5days/ week for 6 weeks. Initially exercises were done for 3 repetitions per session and progressed to 6 repetitions 6 days /week. Samples also received SWD Contra planar technique for 5 days /week for 3 alternate weeks. Post- test done using WOMAC at the end of 6th week.

RESULTS

Table 1. Comparison of WOMAC scale within group a between sub group a1 and sub group A2

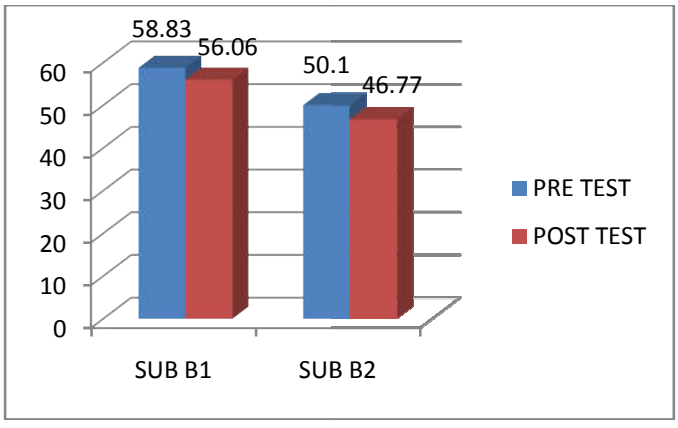
Male	SUB A1		SUB A2		t - test	p – value
	M	SD	M	SD		
Pre test	61.3	8.41	56.85	4.72	1.36	.238***
Post test	58.10	8.53	47.59	4.50	3.44	.232***



Graph 1. Comparison of WOMAC scale within group a between sub group a1 and sub group a2

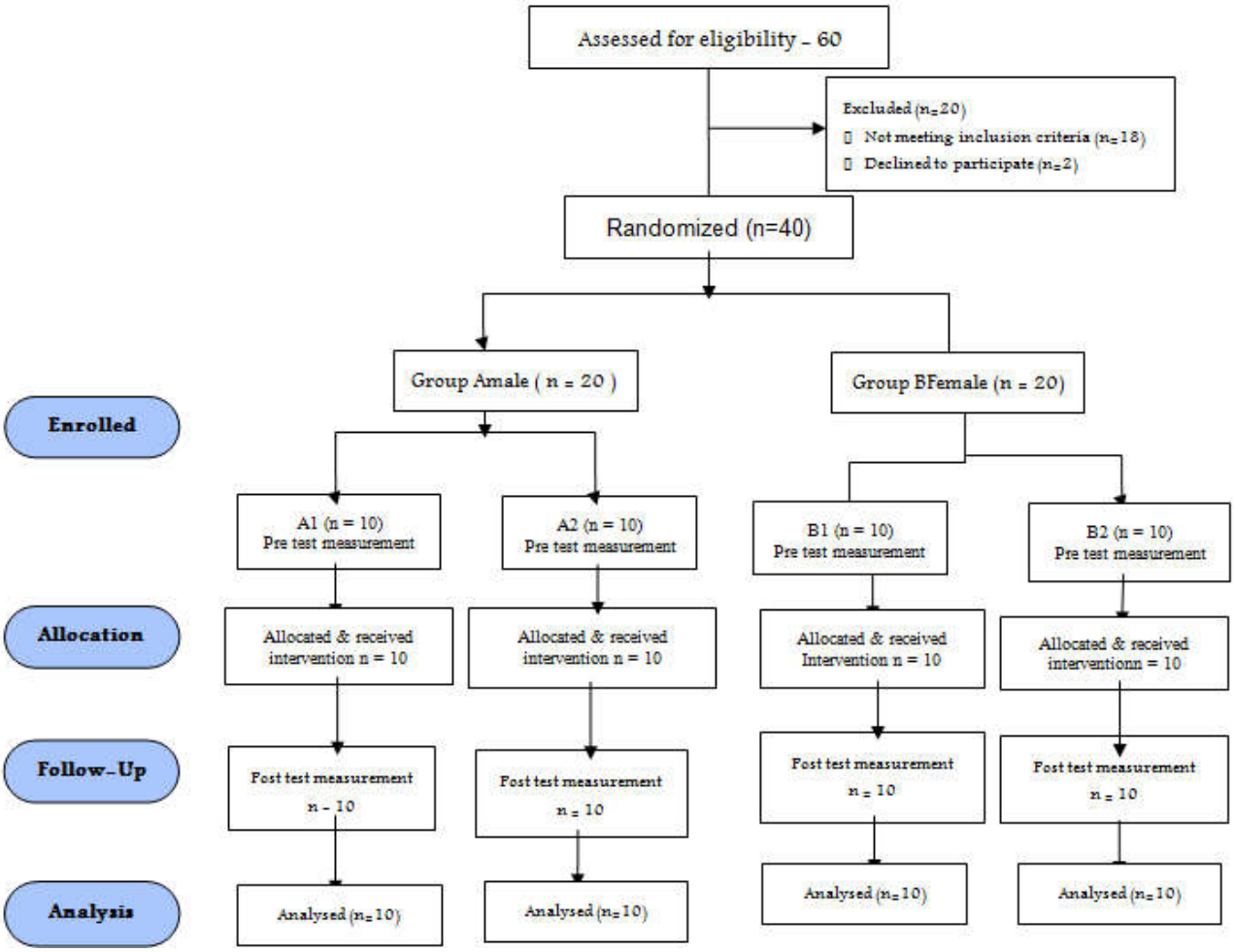
Table 2. Comaparison of WOMAC scale within group b between sub group b1 and sub group b2

Female	SUB B1		SUB B2		t - test	p – value
	M	SD	M	SD		
Pre test	58.83	4.82	50.10	11.67	2.18	.004
Post test	56.06	4.51	46.77	12.09	2.27	.002



Graph 2. Comparison of WOMAC scale within group b between sub group b1 and sub group b2

Consort flow chart



DISCUSSION

The present study was conducted to compare and analyze the effect of combining the hip muscle strengthening along with quadriceps strengthening and gender difference in the management of unilateral OA knee. It was noticed that WOMAC score showed improvement in all four groups. JUN IWAMOTO *et al* (2011) concluded that hip muscle strengthening exercise are effective in reducing pain and improving physical function in patients with mild to moderate OA of the knee. AKINPELU O.A, MORDI E.L *ET AL* (2007) The ratio of quadriceps to hamstring muscle strength in important for the stability of the knee and for reducing excessive stress. All the four groups had equal numbers of participants and showed significant difference in the mean values of post test values. When the Intragroup (paired test) mean values of WOMAC score was analyzed. The mean values of subgroup A_1 pretest of WOMAC (61.3) and post test (58.10). The mean values of subgroup A_2 pretest of WOMAC (56.85) and post test (47.59). The mean values of subgroup B_1 pretest of WOMAC (58.83) and post test (56.06). The mean values of subgroup B_2 pretest of WOMAC (50.10) and post test (46.77) from the data analyzed it showed that there was statistically significant reduction in pain and improvement in function (WOMAC) within four groups. When the intra group (ANOVA) means values of WOMAC was analyzed. subgroup A_1 shows post test mean value of WOMAC (58.10), subgroup A_2shows post test mean value of WOMAC (47.59), subgroup B_1shows post test mean values of WOMAC (56.06), subgroup B_2 shows post test mean values of WOMAC (46.77) clearly indicated that there was statistically significant improvement in reducing pain and improvement in physical function in all four groups but subgroup A_2 shows lower mean value in post test than subgroup A_1, subgroup B_1, subgroup B_2. The subgroup A_2 hip muscle strengthening and quadriceps strengthening exercise along with SWD (males) found to be statistically significant difference at ***$p<0.05$. Secondarily subgroup B_2 hip muscle strengthening and quadriceps strengthening exercise along with SWD (females) is effective, but subgroup A_2 is effective when compared to other three subgroups.

RESULTS

On comparing the mean values of all the four groups quadriceps and hip muscle strengthening, shows significant reduction in the post –test mean but (sub Group A2 in Group A) shows (47.59) lower mean value is more effective than other three groups at $p\leq0.005$.Hence alternate hypothesis accepted.

Conclusion

The study showed that there is significant difference in the post test values of quadriceps strengthening along with hip muscles strengthening more for males than females in OA patients of six week study. Group A sub division A2 showed more

significant difference than the group B. Hence alternate hypothesis is accepted.

Ethical Considerations

The manuscript is approved by the Institutional Review board of faculty of physiotherapy. All the procedures were performed in accordance with the ethical standards of the responsible ethics committee both (Institutional and national) on human experimentation and the Helsinki Declaration of 1964 (as revised in 2008).

Conflict of Interest: 'Conflicts of interest: none'

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