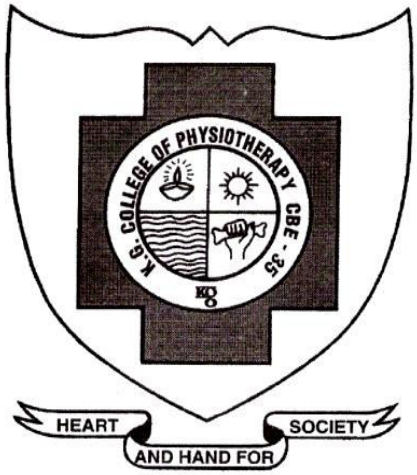
EFFECT OF PROPRIOCEPTIVE EXERCISE AND STRENGTHENING EXERCISE ON FUNCTIONAL ABILITY OF PATIENTS WITH KNEE OSTEOARTHRITIS



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ELECTIVE: PHYSIOTHERAPY IN ORTHOPAEDICS

A DISSERTATION SUBMITTED TO THE TAMILNADU

DR. M. G. R MEDICAL UNIVERSITY, CHENNAI.

AS PARTIAL FULFILLMENT OF THE

MASTER OF PHYSIOTHERAPY DEGREE

APRIL 2016

CERTIFICATE

Certified that this is the bonafide work of **Mr. M. Sri Shankar** of K. G. College of Physiotherapy, Coimbatore submitted in partial fulfillment of the requirements for master of physiotherapy degree course from the Tamil Nadu Dr. M.G.R medical university under the **Registration No: 2714103034** for the April 2016 examination.

Date: Principal

A Dissertation on

EFFECT OF PROPRIOCEPTIVE EXERCISE AND STRENGTHENING EXERCISE ON FUNCTIONAL ABILITY OF PATIENTS WITH KNEE OSTEOARTHRITIS

Has been submitted in partial fulfillment for the requirement of the

Master of Physiotherapy degree

April 2016

Internal examiner External examiner

“EFFECT OF PROPRIOCEPTIVE EXERCISE AND STRENGTHENING EXERCISE ON FUNCTIONAL ABILITY OF PATIENTS WITH KNEE OSTEOARTHRITIS”

Under the guidance of,

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I INTRODUCTION

Osteoarthritis (OA) is one of the burdens in the healthcare profession. It is one of the most prevalent of the rheumatic diseases affects more than 60% of the Adult over the age of the 40 years (Anderson et al., 1995). It is the most common type of arthritis and the major cause of chronic musculoskeletal pain and mobility related disabilities in the elderly. It is being encountered with increasing frequency as the population continues to age. Men are outnumbered than women before age of 45 years. The prevalence of the diseases increases steadily with age.

In India, the prevalence of clinically diagnosed knee OA was higher in the urban community when compared with the rural community. A survey in 2007 revealed that the OA prevalence rate of 32.6% in rural and 60.3% in urban population. OA was present in 50.2% population falling in age group 65-74 years whereas it was 97.7% in age group 84 years or older. (Sharma et al., 2007). Approximately over 15 million every year affected by this. It is the most common cause of locomotors disability in the elderly. (Martin et al., 2002).

Osteoarthritis is a degenerative joint disease involving the cartilage and many of its surrounding tissues. Disease progression is usually slow but lead to joint failure with pain as well as disability (Litwic et al., 2013). There is a great damage and loss of articular cartilage. In addition to this there will be remodeling of subarticular bone, osteophyte formation, ligamentous laxity there will be a sever

weakening of periarticular muscles and synovial inflammation. (Hutton, 1989). Changes in the structures result in an imbalance in the equilibrium between the breakdown and repair of the joint tissues. Many factors concern with the risk factors of OA of the knee include older age, female sex, obesity, osteoporosis, occupation, sports activities, previous trauma, muscle weakness or dysfunction, proprioceptive deficit and genetic factors. (Bosomworth et al., 2009).

OA can develop in any joints but most commonly it affects the knees, hips, hands and facet joints in spine. Hip and knee joints are tend to cause major burden, since both the weight bearing joints affects the population as it produce pain and stiffness lead to significant disability. Knee joint is the most common joint affected by osteoarthritis. Symptoms of the OA include Joint pain, stiffness, and limitation of movement. Disease progression is usually slowly but can ultimately lead to joint failure with pain and disability (Litwic et al., 2013).

Muscle weakness is the major repercussion in OA knee, the major muscle which affect is Quadriceps. Research found that about 15%--18% of OA individuals exhibit quadriceps strength deficits, whereas it increases to 24% in grade II knee OA and 38% in grade IV knee OA. (Petterson et al., 2008). Degeneration in the OA knee may alter the sensory input of the mechanoreceptors and thus decreases the quadriceps activation. (Hurley et al., 1997). Since there is the failure of the quadriceps to activate the muscle role as the shock absorber of the

knee joint reduced. The functional capacity also gets affected due to structural damage around the knee. Though there are many literatures shows quadriceps muscle inactivity following OA, still the mechanism of the weakness is not identified. (Hurley et al., 1997)

Quadriceps weakness is most common among individuals with OA, regardless of the severity of OA the muscle goes atrophy, and muscle weakness is due to failure of the nervous system to fully activate the available muscle fibers. Proprioception has shown to decrease in Osteoarthritis knee when compared with the healthy knee (Koralewicz et al., 2000). Interestingly the proporiceptive deficits are not related to the severity of the OA. Evidences support the loss of muscle strength and development of OA with the long term reduction of physical activity and loss of mechanoreceptors which induced by wear and tear of articular cartilages (Shrier 2004).

Joint proprioception is the ability of an individual to sense the joint position and movement. It encompasses the joint motion and joint position. The reflex contraction of the muscles is stimulated by the proprioceptors that protects joint from the mechanical insults. Conscious contraction is in most cases too slow to prevent the injury, since the nerve paths are usually longer therefore slower. It also involves different sensory systems of muscles, ligaments, tendons, joints, skin, and vision. (Reinmann et al., 2002, Johansson 1991).

Osteoarthritis in the knee cause pain, muscle weakness and physical dysfunctions which form a vicious circle, when the muscle weakened it associated with pain and dysfunction and it play a role on influencing the progression of the diseases. Strengthening exercises are primary to address these problems as well as help in prevention of the deteoriation in OA Knee. (O'Reilly SC, et al., 1998 & Bennell et al., 2005).

Optimal management for the patients with OA of the knee is combination of the pharmacological and the non-pharmacological therapies. Conservative management is the key to mange for the mild to moderate OA of the knee. (Zhang et al., 2008). Because of the muscle weakness associated with pain and physical dysfunction in patients with OA Knee. Exercises are considered the major interventions in the conservative management in the patients with Knee OA. (O'Reilly SC, et al., 1998 & Bennell et al., 2005).

Meta-analyses studies showed the beneficial effects of the strengthening exercises, which play a major role in reduction of pain, strengthening of muscles and improvement of physical function. (Van Baar et al., 1999, Fransen et al., 2003, 2008,& 2009). Various exercises includes aerobic exercises, aquatic exercises, yoga, and Tai Chi have been shown to be effective in improving the functional status of OA knee individuals. (Fransen et al., 2009, Roddy et al., 2005, Bartels et al., 2007, Pisters et al., 2007)

Quadriceps weakness is the major change in OA knee subjects, the lower limb exercises are vigorously implemented (Bennell et al., 2005). A small number of studies have identified the effect of kinesthesia and balance exercise (Proprioceptive exercises) is important in reducing the symptoms and helps in functional improvement when compared to the traditional therapeutic exercises. (Diracoglu et al., 2005 & Fitzgerald et al., 2002). Proprioceptive exercises are designed to improve the dynamic stability using a series of physical activity which challenge the participant's neuromuscular system to maintain the balance and coordination. Usually these exercises are used in the management of ligament injuries such as ACL or ankle ligaments. (Mandelbaum et al., 2005, Liu-Ambrose et al., 2003, & Mcguine et al., 2001). Current literatures show that Proprioceptive exercise has implemented in OA knee has shown beneficial effects. Few case studies have been shown the added effect of these exercises in addition to the normal strengthening exercise. (Fitzgerald et al., 2002).

Western Ontario and Mcmaster Universities Osteoarthritis Index (WOMAC) is valid tool to assess the pain, stiffness and physical function of patients affected from knee and hip osteoarthritis which is a patient report questionnaire where minimal instructions is only needed for the patient and is very reliable tool to assess and reassess the progression. (Bellamy N.2002).

The timed up and go test (TUG) is a simple and low cost test used to assess the functional mobility and balance of individuals especially in elder population (Podsialdo D, Richardson s, 1990). Recent evidences show that the test is used as a valid and reliable tool in assessing the functional mobility and balance in patients with knee osteoarthritis.

1.1 NEED FOR THE STUDY:

Osteoarthritis (OA) is a chronic degenerative disorder with multifactorial etiology which characterized by loss of articular cartilage and periarticular bone remodeling. OA is similar diseases that are more frequently encountered in advancing years (Lawrence et al., 1998). It showed as 5.5 % in urban and 3.3% in rural. (Haq 2011). Osteoarthritis is the most prevalent range from 22% to 39% in India. (Chopra et al.,1997 & 2001). Socioeconomic impact of OA is greater than other diseases due to its higher prevalence.

Typical clinical symptoms are pain, particularly after prolonged activity and weight bearing; whereas stiffness is experienced after inactivity. Osteoarthritis subjects usually complains of difficulty with daily activities like walking, climbing stairs, stooping and standing up from seated position due to pain, weakness and instability (Dillon et al 2006). Multiple researches has identified that degenerative changes in the knee results in altered sensory input to the joint mechanoreceptors which decrease the quadriceps activation leads to weakness and reduced functional

capacity, in addition to it there will be increased structural damage results. (Hurley et al., 1997).

Proprioception is the ability of an individual to sense the joint position and movement. It usually affected by various factors like age, muscle fatigue and osteoarthritis. Many studies showed that proprioception is affected in osteoarthritis as the disease progress and due to local degenerative changes affects all the sensory receptors in the joint due to degeneration (Koralewicz et al., 2000). Knee Joint proprioception in middle aged and elderly persons with advanced knee arthritis is decreased when compare with the middle aged or elderly individuals without arthritis. The loss of proprioception is independent of the severity of arthritis. (Koralewicz et al., 2000).

Treatment options for the management of the osteoarthritis vary from conservative to surgical and physiotherapy. Physiotherapy plays a key role in the management of OA knee, which includes exercises for the quadriceps and hamstrings. Strengthening exercises appears to be superior to the other form of exercises like aerobics. (Bennell et al., 2005).

Exercises strengthen the muscles, reduce pain, improve physical function, and are therefore considered a major intervention in the conservative treatment of patients with knee OA. In addition to muscle strengthening exercises, stretching exercises are commonly used to increase ROM and are often prescribed in

rehabilitation protocols as part of routine warm-up to prepare the muscles and joints for other types of exercise, such as aerobic and strengthening programs. Balance exercises are found to be effective for the declining knee stability which was seen in the OA knee. Performing balance exercise can help the stability of the knee joints as well as performance of harder movements in daily activities. There are various studies on treatment of pain and functional disorder in knee OA. But those related to proprioception and disorder is very less. (Konradsen, 1991). Although it still remains controversial as to which type of exercise programs may be more effective for the treatment of OA of the knee, this line of evidence does indicate the short-term beneficial effects of both muscles. So the purpose of the study is to identify which exercise is better in improvement of proprioception in OA knee.

1.2 AIM OF THE STUDY

- The aim of the study is to find the effect of Proprioceptive exercises with strengthening exercise on functional ability in patients with knee osteoarthritis.

1.3 OBJECTIVES OF THE STUDY

- To find out effect of Proprioceptive exercises on functional ability in patients with knee osteoarthritis.
- To find out the effect of strengthening exercises on functional ability in patients with knee osteoarthritis.
- To compare the effect of Proprioceptive exercises with strengthening exercise and strengthening exercise alone on functional ability in patients with knee osteoarthritis.

1.4 HYPOTHESIS

Null Hypothesis

- There is no significant effect of the Proprioceptive exercises and strengthening exercise on functional ability in patients with knee osteoarthritis.

Alternate Hypothesis

- There is a significant effect of Proprioceptive exercises and strengthening exercise on functional ability in patients with knee osteoarthritis.

II REVIEW OF LITERATURE

Alghadir et al., (2015) stated that the intra- and inter-rater reliability of the Timed Up and Go test measurements were good to excellent with adequate minimal detectable change for clinical use in individuals with doubtful to moderate (Grade 1–3) knee OA. Further study is warranted to validate the Timed Up and Go test as a single measure of physical function of individuals with knee osteoarthritis.

Zasadzka et al., (2015) study results indicated that TUG is useful tool for screening elderly populations with OA to predict mobility loss and frequency of falls. Thus, it seems prudent to identify older OA patients at a higher risk of falling and encourage them to engage in appropriate treatment strategies, indicating the need for fall prevention interventions in this age group.

Latif Naveen Abdel et al.,(2013) conducted a study to investigate the impact of neuromuscular training and neuromuscular electrical stimulation (NMES) on balance in Knee OA. They concluded that Neuromuscular training has a higher beneficial effect for treatment of patients with Knee OA than neuromuscular electrical stimulation.

Matthew W. Roger, et al., (2012) conducted a study to determine the efficacy of a home-based KBA exercise program to improve symptoms and quality of life among persons with symptomatic knee OA. Their results indicate that KBA, RT,

or a combination of the two administered as home exercise programs appear effective in reducing symptoms and improving the quality of life among persons with knee OA.

Rachel Brakke et al.,(2012) conducted a study to investigate the effects of physical therapy in osteoarthritis. They concluded that the most beneficial therapy modalities related to OA are strengthening, aquatic therapy, and balance and perturbation therapy with respect to reducing pain and improving function.

Nader Rahnama et al.,(2012) performed a study to investigate the effects of two types of rehabilitation techniques, including aerobic and strengthening exercises on patients with knee rheumatoid arthritis. Their results showed that both aerobic and strengthening exercises can reduce pain, improve functional status, walking ability, and flexion and extension ROMs of the knee joints in patients with knee Rheumatoid Arthritis.

Kelley Fitzgerald, et al., (2011) studied on agility and perturbation training technique in exercise therapy for reducing pain and improving function in people with knee osteoarthritis. They concluded that both intervention groups exhibited some moderate improvements in self-reported outcome measures, there was no additive benefit from including agility and perturbation training techniques in a standard exercise program for their participants with knee Osteoarthritis.

Auw Yang et al., (2007) conducted a study on the validation of short form of WOMAC functional scale for evaluation of knee osteoarthritis and concluded the scale is valid, reliable and responsive. They stated that because of its better responsiveness case of use, low missing data rate and ability to highlight patient priorities he WOMAC could be an interesting tool in therapeutic evaluation of hip and knee osteoarthritis.

Bhattacharya et al. (2006) He studied 30 subjects with unilateral knee osteoarthritis. The subjects were randomly assigned into two groups either proprioceptive training group or conventional therapy group. The variables like knee joint proprioception, visual analogue scale, joint range of motion, Western Ontario and McMaster Universities (WOMAC) index, isometric strength of quadriceps were measured. The treatment was given for a period of six weeks. The study demonstrated that the subjects who received proprioceptive training improved to a greater extent in their functional ability than subjects who received only conventional therapy.

Alan E.Mikesky et al.,(2006) evaluated the effects of strength training on the incidence and progression of knee osteoarthritis. They concluded that, the ST group retained more strength and exhibited less frequent progressive Joint Space Narrowing over 30 months than the ROM group.

Demirhan Dlracoglu, et al.,(2005) investigated the effects of balance and kinesthesia exercises on knee OA. Statistically significant improvements were observed post exercise for both groups with respect to baseline for WOMAC, SF-36 Form, times for performing activities of daily living, isokinetic quadriceps muscle strength, and Proprioceptive sensation levels. In the first group with kinesthesia training, compared with the second group. This study has demonstrated that addition of kinesthesia and balance exercises that help neuromuscular restoration standard strengthening exercises provides dynamic muscle strength increase with significant recoveries in the functional satus of the patients.

Roddy et al.,(2004) investigate the evidence based recommendation for the role of exercise in the management of the osteoarthritis of hip or knee. They concluded that improvements in muscle strength and proprioception gained from exercise programs may reduce the progression of knee and hip OA.

Marc Faucher et al., (2004) conducted a study to assess the test and retest reliability and construct validity of a modified version of French Canadian version of WOMAC index. Despite its good test retest reliability, the modified WOMAC index is not valid for assessing pain and disability induced by knee osteoarthritis in French population. Section A and modified section C could be used separately to assess pain and function.

Tuzun et al., (2004) studied the acceptability, reliability, validity and responsiveness of Turkish version of WOMAC osteoarthritis index which showed the overall response rate was 100%. Alpha values for all WOMAC subscales exceeded the value of 0.70 at both baseline and follow up assessments. Frequency distributions of scores were symmetrical. Subscales had negligible floor and ceiling effects. Both pain and physical function subscales were fairly correlated with the subscales measuring similar constructs of SF-36, whereas they were weakly correlated with other dimensions of SF-36. A good correlation was obtained between WOMAC total and Lequesne index. The pain and physical function subscales of WOMAC index were the most responsive subscales and concluded that it's a valid and reliable test in evaluating knee osteoarthritis patients.

Salaffi et al., (2003) concluded that the Italian version of WOMAC is a reliable and valid instrument for evaluating the severity of osteoarthritis of the knee, with metric properties in agreement with the original, widely used version.

Gul Baltaci, et al.,(2003) Studied on proprioceptive training during knee and ankle injuries, they evaluated range of motion, return to activity, muscle strength and endurance. Proprioceptive training has been shown to be successful in the management of knee and ankle injuries. In addition, uninjured athletes may benefit from incorporating proprioceptive exercise into their training programme.

Robert Toop et al., (2002) investigated the effects of dynamic versus isometric resistance training on pain and functioning among adults with osteoarthritis of the knee. Their results showed that dynamic or isometric resistance training improves functional ability and reduces knee joint pain of patients with knee OA.

Henrik Rogind et al.,(1998) investigated physical function in patients with severe osteoarthritis (OA) of the knees during and after a general physical training program. Twelve patients received training in groups of 6, twice a week for 3 months. Training focused on general fitness, balance, coordination, stretching, and lower extremity muscle strength, and included a daily home exercise program. They concluded that general physical training appears to be beneficial to patients with OA of the knee, as shown by the high compliance and low dropout frequency, such a program is feasible even in patients with severe OA of the knee.

Hurley et al.,(1997) investigated the effects of a 6 week multi-station proprioceptive exercise program on functional capacity, perceived knee pain, and sensoriomotor function in patients with bilateral knee osteoarthrosis. Their findings suggested that using a pure proprioceptive/balance exercise program it is possible to improve functional capacity, postural control and decrease perceived knee pain in patients with bilateral knee osteoarthrosis.

Walter H. Ettinger Jr et al.,(1997) determined the effects of an aerobic exercise program, a resistance exercise program, and a health education program. The primary outcome was self-reported disability score (range, 1-5). The secondary outcomes were knee pain score (range, 1-6), performance measures of physical function, x-ray score, aerobic capacity, and knee muscle strength. Older disabled persons with osteoarthritis of the knee had modest improvements in measures of disability, physical performance, and pain from participating in either an aerobic or a resistance exercise program. These data suggest that exercise should be prescribed as part of the treatment for knee osteoarthritis.

III METHODOLOGY

3.1 STUDY DESIGN:

Pre test and post test experimental study design

3.2 STUDY SETTING

Department of Physiotherapy, K. G Hospital, Coimbatore.

3.3 STUDY SAMPLES

Systematic random sampling method, 40 patients with knee osteoarthritis, who fulfilled the predetermined inclusive and exclusive criteria were selected and divided in to two groups each consisted of 20 patients.

3.4 STUDY DURATION

Total study duration was one year and each patient received treatment for a duration of 8 weeks.

3.5 CRITERIA FOR SELECTION

INCLUSION CRITERIA:

- Patient diagnosed with primary osteoarthritis of the knee by orthopaedic physician.
- Patients with unilateral osteoarthritis of knee.

- WOMAC pain score greater than 5.
- Both sexes were included
- Age group 55-65 years
- Patients who are able to perform the exercises.
- Patients who are willing to participate in the study.

EXCLUSION CRITERIA:

- Knee pain attributable to a cause other than primary osteoarthritis.
- Including fibromyalgia
- Bursitis
- Tendonitis
- Rupture or tear in the articular cartilage (evidences by a positive Mc Murray sign).
- Athropathy of the knee on pain in the lower back, hips or ankles.
- Any contra indication for exercise.
- Cardiomyopathy severe enough to compromise cardiac functioning.
- Any patients who were currently participating in an organized exercise program or exercised more than 1 hour per week.

3.6 VARIABLES

INDEPENDENT VARAIBLES:

- Proprioceptive exercises.
- Strengthening exercises

DEPENDENT VAIABLES:

- Functional disability.
- Functional mobility and Balance

3.7 OPERATIONAL TOOLS

- WOMAC scale.
- Timed up and go test.

3.8 PARAMETERS

- Functional disability.
- Functional mobility and Balance.

3.9 PROCEDURE

Patients with osteoarthritis of knee who visited department of physiotherapy of K.G Hospital were selected for the study. Out of which 40 patients who fulfilled the inclusive and exclusive criteria were selected. All the patients were examined by orthopedician and a senior physiotherapist. A clear explanation was given to every patient about the procedures and written consent was obtained.

All 40 patients were randomly assigned into two groups. A randomization process was used, where subjects randomly chosen from the list of participant's name, all the names were entered in the list and every 2nd person is included for the experimental group and the every 1st person in control group. This ensured that they were even number of subjects in each group. Each group consisted of 20 patients and all patients remained in the group to which they are originally assigned.

Group A – Patients underwent proprioceptive exercise along with strengthening exercise for thrice a week of thirty minutes per session for eight weeks.

Group B – Patients underwent strengthening exercise alone thrice a week of thirty minutes per session for eight weeks.

A clear explanation about the proprioceptive exercise are given in appendix III and that of strengthening exercise are given in appendix IV.

3.10 ETHICAL APPROVAL

The study was approved by the ethical committee of KG hospital Coimbatore.

3.11 STASTISTICAL TOOLS

The following statistical tools were used to functional disability and functional mobility and balance. The paired "t test" was used to compare the pre and post test values for Group A & B.

Formula: Paired t-test

$$S = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

$$t = \frac{\overline{d}\sqrt{n}}{s}$$

Where,

d = difference between the pretest versus post test

$\overline{d}$ = mean difference

n = total number of subjects

S = standard deviation

Unpaired 't' test:

The unpaired't' test was used to compare the pretest and posttest values between the two groups.

Formula: Unpaired t-test

$$S = \sqrt{\frac{\sum\left(X_1 - \overline{X_1}\right)^2 + \sum\left(X_2 - \overline{X_2}\right)^2}{n_1 + n_2 - 2}}$$

$$t = \frac{\overline{X_1} - \overline{X_2}}{S}\sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

Where,

$\overline{x_1}$ = Mean of Group A

$\overline{x_2}$ = Mean of Group B

$\sum$ = sum of the value

n_1 = number of subjects in Group A

n2 = number of subjects in Group B

S = combined standard deviation.

LEVEL OF SIGNIFICANCE – 5%

IV DATA ANALYSIS AND INTERPRETATION

TABLE I

DEMOGRAPHIC DATA

S.NO	AGE GROUP CLASSIFICATION	MALE	FEMALE
1	55-58	5	4
2	59-62	8	6
3	63-65	9	8
	TOTAL	22	18

GRAPH I

AGE GROUP CLASSIFICATION

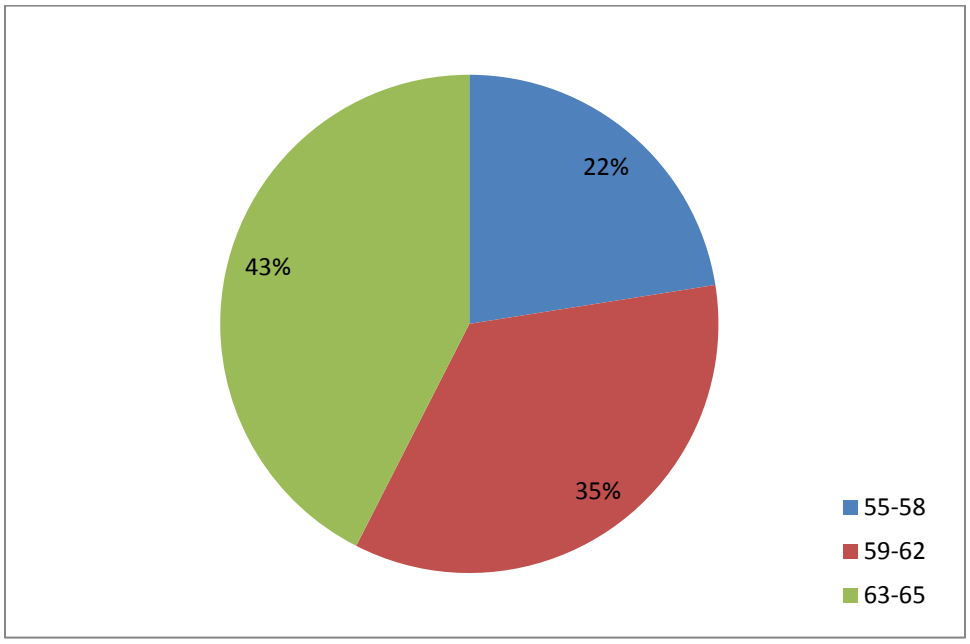


TABLE - II

PAIRED T TEST – GROUP A

WOMAC SCALE

The comparative mean values, mean difference, standard deviation and paired 't' test values of Group A.

S.N	GROUP-A	Mean	Mean Difference	S.D	Paired 't' value
1.	Pre test	75.25	60.35	1.62	122.28
2.	Post test	14.90		2.49	

The table II shows analysis of WOMAC on paired t test. The t test value of Group A was 122.28 at 0.05% level of significance, which is greater than the tabulated t value 2.093. The results show that there was marked difference between pre test and post test values.

GRAPH II

Paired t test on pre and post test values of Group A on WOMAC scale

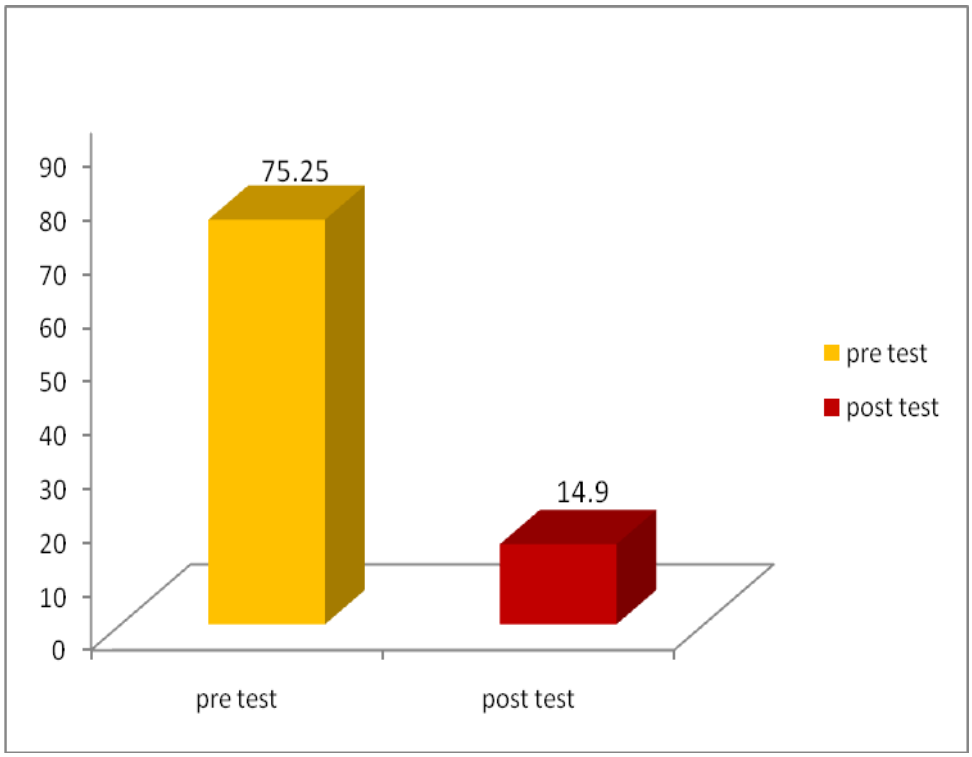


TABLE III

PAIRED T TEST – GROUP B

WOMAC SCALE

The comparative mean values, mean difference, standard deviation and paired 't' test values of Group B.

S.NO	GROUP-B	Mean	Mean Difference	S.D	Paired 't' value
1.	Pre test	76.15	38.45	1.84	33.22
2.	Post test	37.70		4.69	

The table III shows analysis of WOMAC on paired t test. The t test value of Group B was 33.22 at 0.05% level of significance, which is greater than the tabulated t value 2.093. The results show that there was marked difference between pre test and post test values.

GRAPH III

Paired t test on pre and post test values of Group B on WOMAC scale

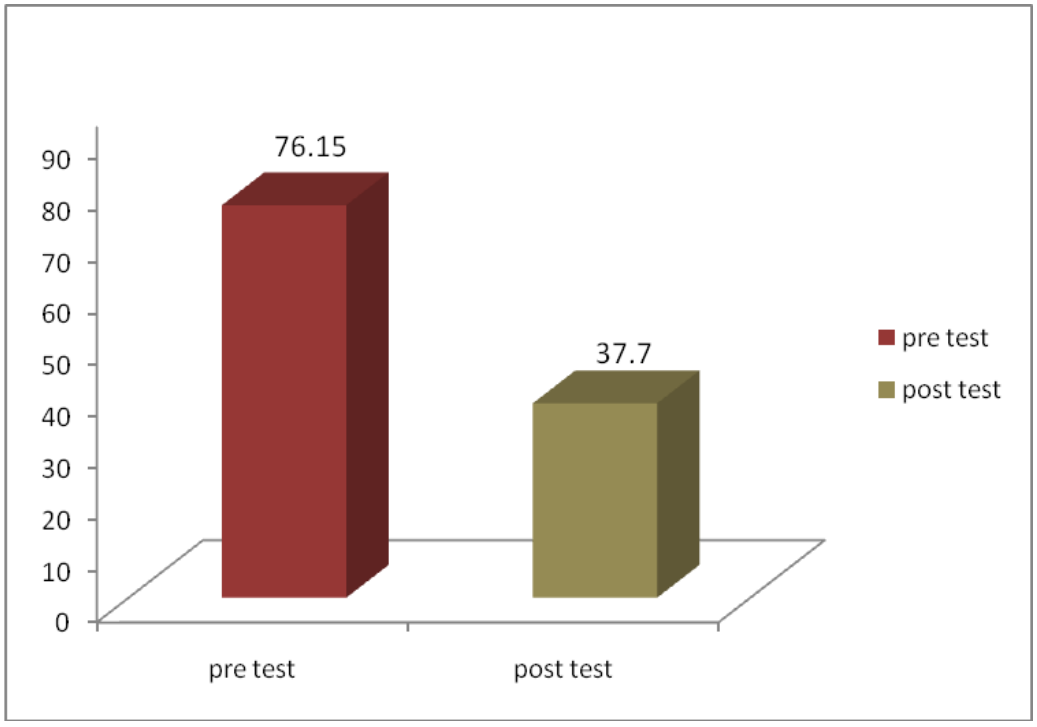


TABLE - IV

PAIRED T TEST – GROUP A

TUG TEST

The comparative mean values, mean difference, standard deviation and paired 't' test values of Group A.

S.NO	GROUP-A	Mean	Mean Difference	S.D	Paired 't' value
1.	Pre test	13.18	6.25	1.45	16.57
2.	Post test	6.93		0.89	

The table IV shows analysis of TUG test on paired t test. The t test value of Group A was 16.57at 0.05% level of significance, which is greater than the tabulated t value 2.093. The results show that there was marked difference between pre test and post test values.

GRAPH IV

Paired t test of pre and post test values of Group A on TUG test

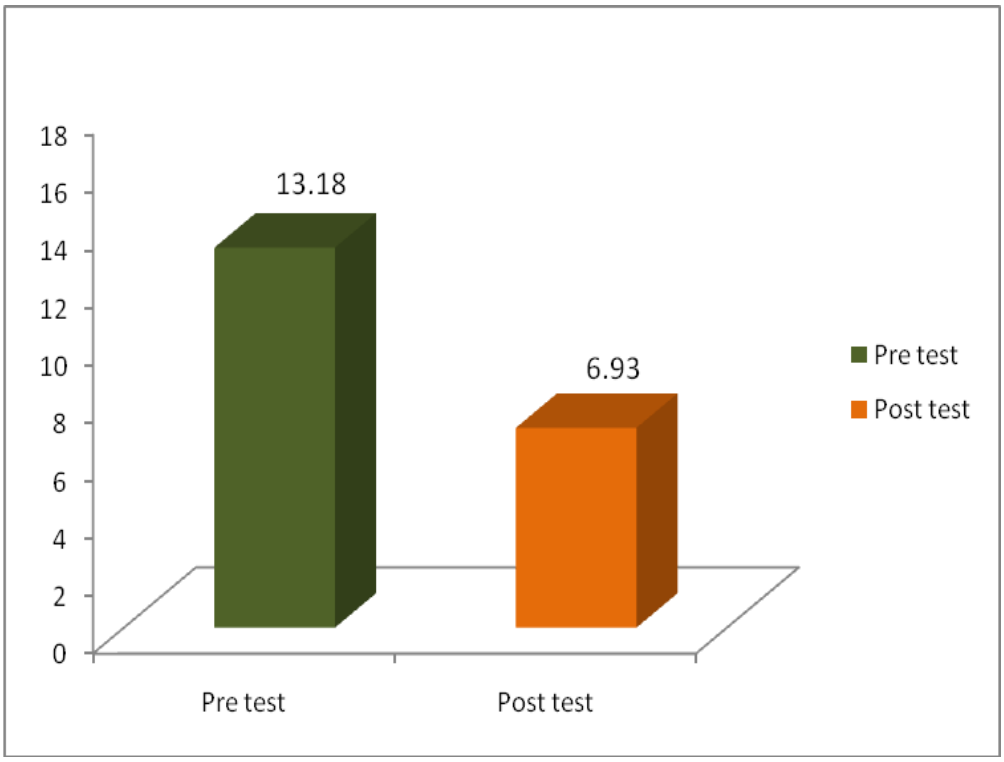


TABLE – V

PAIRED T TEST – GROUP B

TUG TEST

The comparative mean values, mean difference, standard deviation and paired 't' test values of Group B.

S.NO	GROUP-B	Mean	Mean Difference	S.D	Paired 't' value
1.	Pre test	12.89	2.51	1.44	13.67
2.	Post test	10.38		1.29	

The table V shows analysis of TUG test on paired t test. The t test value of Group B was 13.67 at 0.05% level of significance, which is greater than the tabulated t value 2.093. The results show that there was marked difference between pre test and post test values.

GRAPH V

Paired t test of pre and post test values of Group B on TUG test

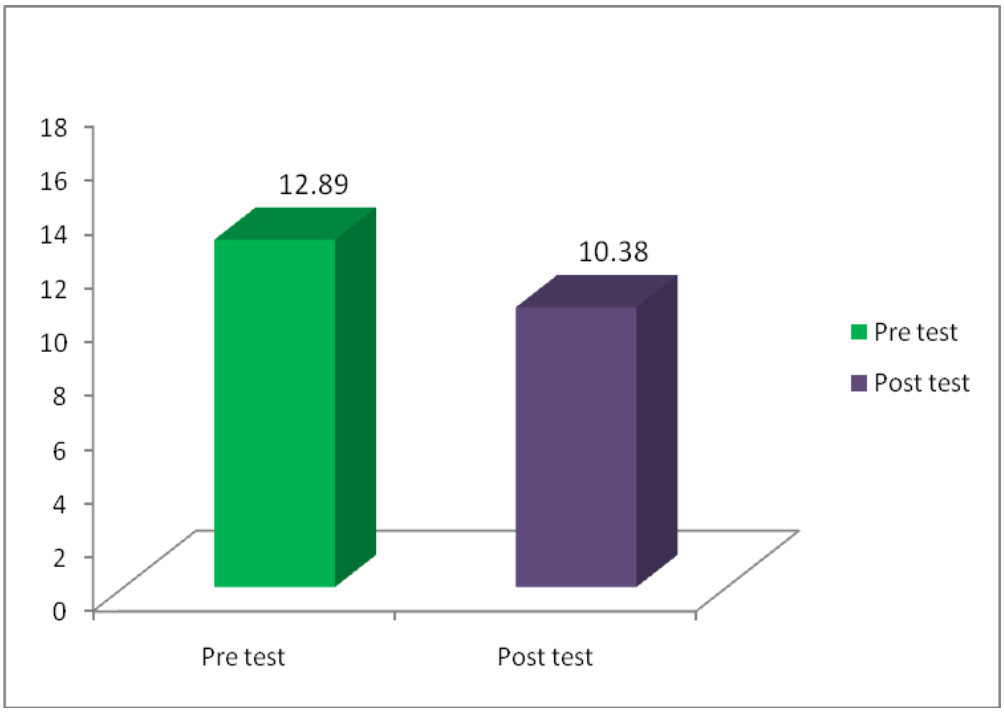


TABLE - VI

UNPAIRED T TEST – COMPARISON OF PRETEST WOMAC SCALE VALUES OF GROUP A AND GROUP B

The comparative mean values, mean difference, standard deviation and unpaired 't' test values of Group A and Group B.

S.NO	GROUP	Mean	Mean Difference	S.D	Unpaired 't' value
1.	GROUP A	75.25	0.9	1.60	1.64
2.	GROUP B	76.15		1.84	

The table VI shows analysis of WOMAC on unpaired t test. The pre test value of Group A and Group B was 1.64 at 0.05% level of significance, which was lesser than the tabulated t value 1.960. The results show that there was marked difference between GROUP A and GROUP B.

GRAPH VI

Unpaired t test on pre test values of Group A and Group B on WOMAC scale

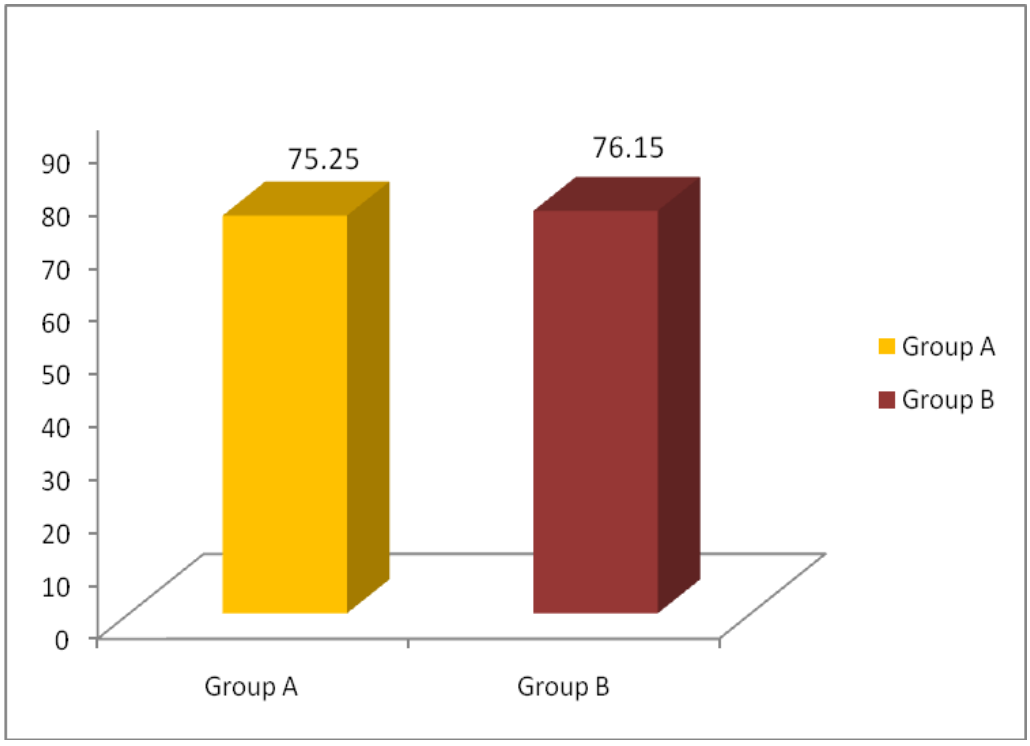


TABLE – VII

UNPAIRED T TEST – COMPARISON OF PRE TEST TUG TEST VALUES OF GROUP A AND GROUP B

The comparative mean values, mean difference, standard deviation and unpaired 't' test values of Group A and Group B.

S.NO	GROUP	Mean	Mean Difference	S.D	Unpaired 't' value
1.	GROUP A	13.18	0.29	1.45	0.633
2.	GROUP B	12.89		1.44	

The table VII shows analysis of TUG test on unpaired t test. The pre test value of Group A and Group B was 0.633 at 0.05% level of significance, which was lesser than the tabulated t value 1.960. The results show that there was marked difference between GROUP A and GROUP B.

GRAPH VII

Unpaired t test on pre test values of Group A and Group B on TUG TEST

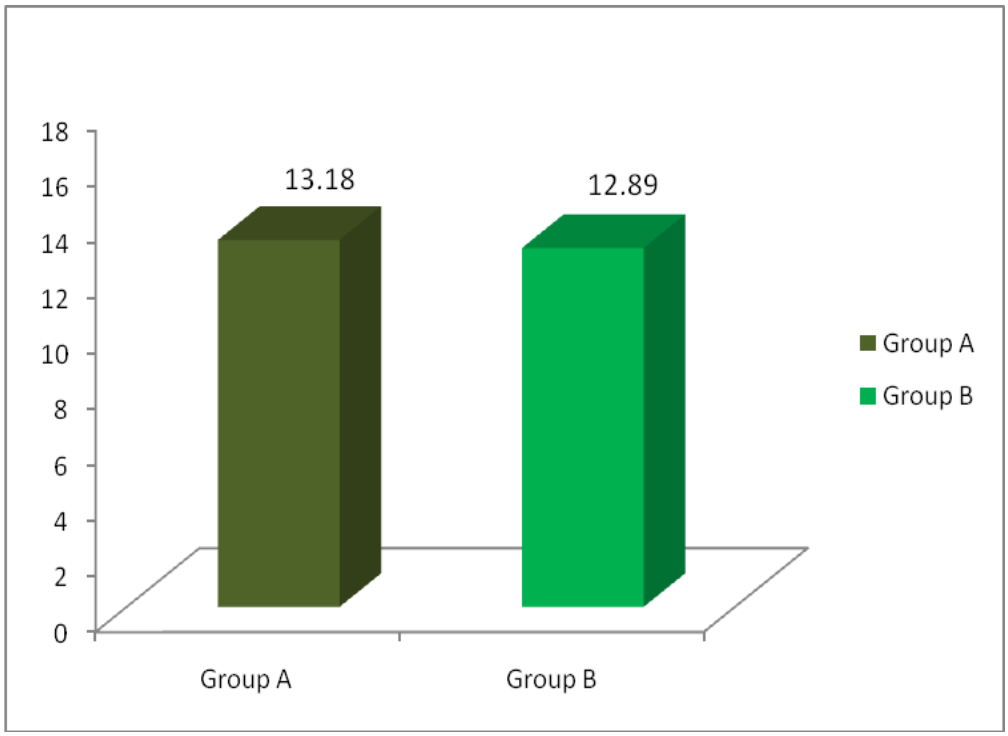


TABLE - VIII

UNPAIRED T TEST – COMPARISON OF POSTTEST WOMAC TEST VALUES OF GROUP A AND GROUP B

The comparative mean values, mean difference, standard deviation and paired 't' test values of Group A and Group B.

S.NO	GROUP	Mean	Mean Difference	S.D	Unpaired 't' value
1.	GROUP A	14.90	22.8	2.49	19.197
2.	GROUP B	37.70		4.69	

The table VIII shows analysis of WOMAC test on unpaired t test. The post test value of Group A and Group B was 19.197 at 0.05% level of significance, which was greater than the tabulated t value 1.960 . The results show that there was marked difference between Group A and Group B.

GRAPH VIII

Unpaired t test on post test values of Group A and Group B on WOMAC scale

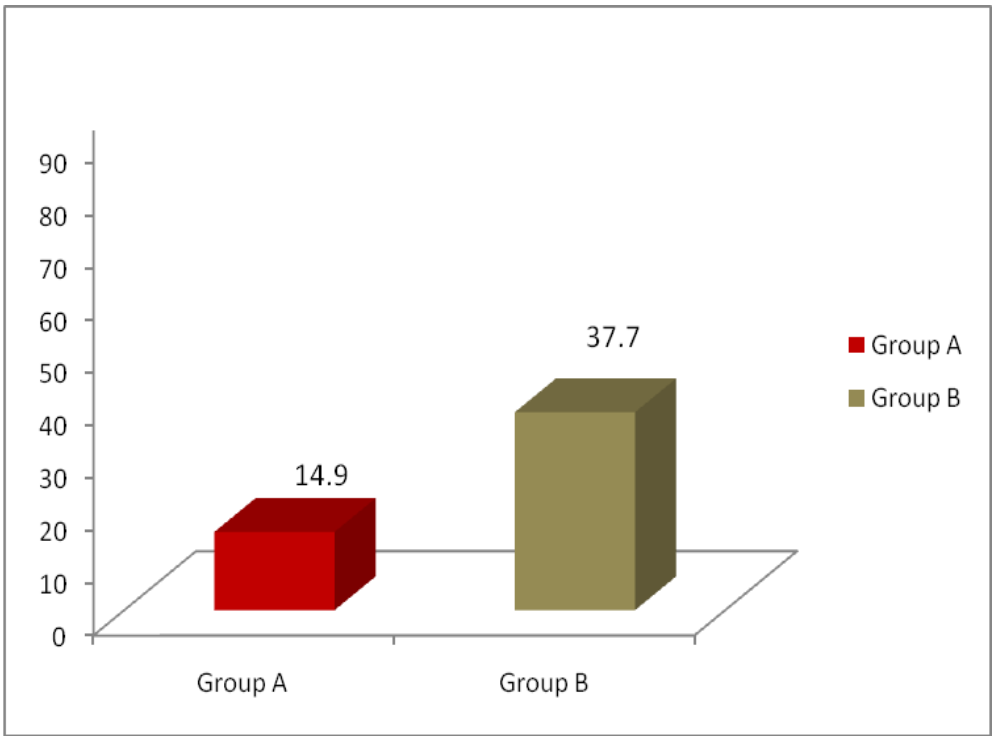


TABLE - IX

UNPAIRED T TEST – COMPARISON OF POST TEST VALUES OF GROUP A AND GROUP B TUG TEST

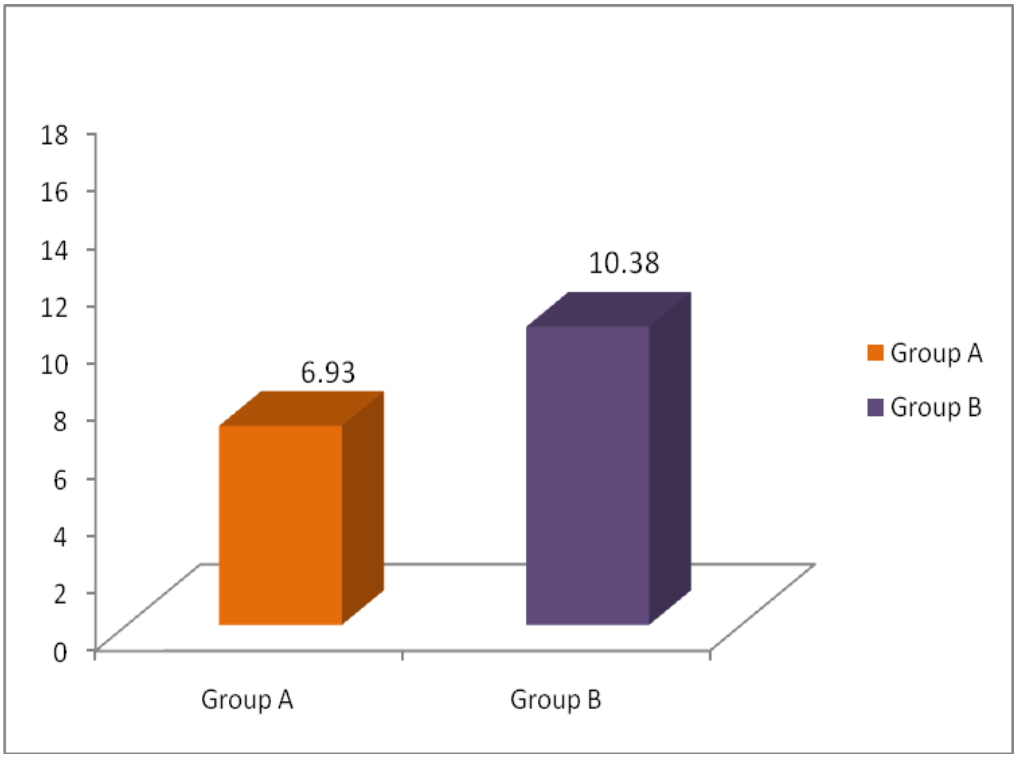
The comparative mean values, mean difference, standard deviation and unpaired 't' test values of Group A and Group B.

S.NO	GROUP	Mean	Mean Difference	S.D	Unpaired 't' value
1.	GROUP A	6.93	3.45	0.89	9.804
2.	GROUP B	10.38		1.29	

The table IX shows analysis of TUG test on unpaired t test. The post test value of Group A and Group B was 9.804 at 0.05% level of significance, which was greater than the tabulated t value 1.960. The results show that there was marked difference between Group A and Group B.

GRAPH IX

Unpaired t test on post test values of Group A and Group B on TUG test



V RESULTS

The demographic representations of the groups are given in table I. Age group of the participants varies from 55 years to 65 years and about 43 % from age group of 63—65 years, 35% are from age group of 59—62 years, 22% from 55—58 years ,consisting a total of 40 patients with 22 male patients and 18 female patients.

The Paired 't' test analyses for the pre test and post test variable for the functional disability using WOMAC scale of is shown in table II and III .Both the groups show significant differences in the pre test and post test values. The 't' value for the Group A is 122.28, the 't' value for the Group B is 33.22.

The unpaired't' test analysis for the pre test variables of both groups on functional disability using WOMAC scale is shown in table VI. There was a significant difference shown between the Groups. Subjects in Group A show superior mean difference than Group B. The 't' value for the pre test variables for both groups is 1.641.

The unpaired't' test analysis for the post test variables of both groups on functional disability using WOMAC scale is shown in table VIII. There was a significant difference shown between the Groups. Subjects in Group A show

superior mean difference than Group B. The ‘t’ value for the post test variables for both groups is 19.19.

The Paired ‘t’ test analyses for the pre test and post test variable for the functional mobility and balance using TUG test is shown in table IV and V. Both the groups show significant differences in the pre test and post test values. The ‘t’ value for the Group A is 16.57, the ‘t’ value for the Group B is 13.677.

The unpaired ‘t’ test analysis for the pre test variables for both group on functional mobility and balance using TUG test is shown in table VII. There was a significant difference shown between the Groups. Subjects in Group A show superior mean difference than Group B. The ‘t’ value for the pre test variables for both groups is 0.633.

The unpaired ‘t’ test analysis for the post test variables of both group on functional mobility and balance using TUG test is shown in IX. There was a significant difference shown between the Groups. Subjects in Group A show superior mean difference than Group B. The ‘t’ value for the post test variables for both groups is 9.8045.

VI DISCUSSION

The purpose of the study is to compare the effect of Proprioceptive exercises with strengthening exercise on functional ability in patients with knee osteoarthritis. 40 patients who complain of Osteoarthritis visited the outpatient department with age group of 55—65 years were selected for the study. All were subjects were divided into two equal groups 20 subjects in each group. Group A subjects underwent Proprioceptive exercises with Strengthening exercises whereas Group B received Strengthening exercises.

Osteoarthritis (OA) of the knee is the most common type of arthritis and the major cause of chronic musculoskeletal pain and mobility disability in the elderly, and therefore represents a significant burden on healthcare provision. (Fitzgerald 2005). Degenerative osteoarthritis is caused by damage of joint cartilages and it happens for two reasons. First joint tissues are damaged by excessive loads, second weak cartilage or bone degeneration result in Osteoarthritis. It lead to greater pain and decrease functional activities like weakness of quadriceps, reduced mobility, stiff joint, limited movement and reduced proprioception. (Sharma et al., 2003).

Weakness of the muscles or asymmetric activities of the muscles lead to unstable joint and aggravates muscle by lesser use. Reduction of balance and walking ability which result in falls in elderly. (Ettinger et al., 1994). Loss of muscle strength or weakness of quadriceps may lead to pain and disability,

decreased facilitation of the quadriceps, proprioception and postural control. Injuries to the mechanoreceptors of the cartilage defect the motor control and joint position sense. (Creamer et al., 1999)

Conservative treatment is advocated in patients with mild to moderate OA of the knee. Because muscle weakness is associated with pain and physical dysfunction and influences the progression of the disease in patients with OA of the knee (O'Reilly et al.,1997, 1998), muscle strengthening is a key component in cases of OA (Bennell 2005).

Knee joint is the weight bearing joint which is vulnerable for traumas during daily life activities. To protect the joint from these effects, maintenance of perfect joint stability is certainly required. Proprioceptive information is an important mediator of timely and appropriate voluntary and involuntary movements.(Sharma et al., 1999). The association between OA and loss of Proprioceptive sense has been demonstrated. (Gardsen et al., 1999& Koralewicz et al., 2000). Although the source of the Proprioceptive deficit is not well known yet, it is known that it is not a local result of the disease. (Gardsen et al., 1999).

Lund et al, showed that in patients with unilateral knee OA, Proprioceptive sense of both knees were impaired equally and that this defect was present also in elbow joints. These results supported that "impaired proprioception is general problem and not a local phenomenon in knee OA patients."(Lund et al., 2004). As

a consequence of the insufficient working of the Proprioceptive system, neuromuscular control cannot be maintained, protective muscle activities cannot be performed, and joint stabilization cannot be provided. (Prentice 1994). In this condition, the joint is vulnerable to external traumatic stimulations. The trauma the joint structures are exposed to will cause structural impairment of the mechanoreceptors that are the source of proprioception and thus proprioception will be more impaired.(Sharma et al., 1999).

Theoretically, it was hypothesized that balance and kinesthesia exercises affect proprioception better than standard strengthening exercises. General exercise program may not have influence to stimulate the proprioceptors and hence it could not activate the Proprioceptive system sufficiently. To overcome this deficiency the new technique of Proprioceptive were included. (Beynnon et al., 2000). However, current studies show that the effects of proprioceptive sensory system on daily life activities in patients with OA are not known completely. Although they showed that impaired proprioceptive sense had effects on functional parameters such as impairment in walking rhythm, shortened distance of step, and decrease in gait speed, and total duration of walking,(Sharma et al., 1997, Sharma et al., 1997 & Skinner 1984).

In this study the subjects in Group A, Subjects underwent Proprioceptive exercise programme through a set of exercise protocol which was formulated by

department of physiotherapy, K.G.Hospital. All the subjects in the group underwent six weeks of training programme. Following the treatment, their pre test values and the post test values were calculated and analyzed for the results.

Poor dynamic joint stability and neuromuscular control are commonly associated with OA knee. Proprioceptive exercises should be incorporated in OA Knee. (Hubely-Kozey et al., 2008, Lewek et al., 2004). These exercises focus on neuromuscular training and are designed to improve dynamic joint stability and neuromuscular control. Proprioceptive exercises challenge various systems including visual, vestibular and somtosensory systems. (Taylor 2011).

Several studies have focused on improvement of balance following Proprioceptive exercises. Study done by Sekir and Gur 2005 focus on six week multi-station Proprioceptive exercise programme chiefly to improve postural control, functional capacity and knee pain. Another study done by Rogers et al., 2011 shows that Proprioceptive exercise alone improves the pain, stiffness and physical function of subjects with knee OA equally to the strength training programme.

Balance training is more effective way for knee osteoarthritis. (Hinman et al., 2002), these are very important to manage the reduction of knee stability. It improves stability and help to protect knee joint from noxious loads. Performing

balance exercise can help the stability of the knee joint as well as performance of harder movement in daily activities. (Fitzgerald et al, 2002).

Exercise regimens containing repetitive movements increase the ability of the person's control over joint movements in all positions. Dynamic stability may help to control abnormal joint translation that occurs during daily movements and may provide increased motor control through a reflex route. (Brinkmann et al., 1985).

Group B subjects underwent Strengthening exercise programme for the knee joint, the protocols were formulated by department of physiotherapy, K.G.Hospital. All the subjects in the group underwent six weeks of training programme. Following the treatment, their pre test values and the post test values were calculated and analyzed for the results.

Strengthening exercises induce great shearing force, less dangerous exercise manner are groped. (Bakhtiarty et al., 2008). Resistance exercise on knee muscle is a suitable way to put less load on joints during various positions. (Page et al., 2003). Exercises are considered one of the major interventions in the conservative treatment of patients with knee OA.(Messier etal., 2004). The major objectives are as follows: pain reduction; function improvement; and improvement in social and occupational aspects.(Bennell et al., 2011). In addition to it the exercises to the

knee joint contributes improvement in the muscle power, flexibility, motor ability and improves the ADL. (Kauffman 1985, Fisher et al., 1993).

Quadriceps muscle weakness is one of the major musculoskeletal repercussions in the OA Knee. (Petterson et al., 2008). Hurley et al.1997 have suggested that degenerative changes in the OA knee structure might result in altered sensory input to joint mechanoreceptors, thus decreasing quadriceps activation. Thus, the quadriceps weakness of patients with OA is worth noting. Moderate exercise may be a good treatment not only to improve joint symptoms and function, but also to improve knee cartilage glycosaminoglycan in patients at high risk of developing OA.(Ross et al., 2005)

Based on the statistical analysis the result of the study shows that the propiroceptive exercises has shown remarkable improvement in the functional ability than the general exercises for OA Knee.

VII SUMMARY AND CONCLUSION

SUMMARY

The purpose of the study was to find out the effect of proprioceptive exercises and strengthening exercises on functional ability of patients with knee osteoarthritis.

40 subjects with the age group of 55—65 years were randomly selected for the study. All the subjects were selected following the due consideration of inclusion and exclusion criteria. A detailed examination was done for all the selected subjects by a senior orthopaedic surgeon and a senior physiotherapist to rule out the exclusion and include the subjects in the study. Clear explanation was given to all the subjects and consent was received from them. They all are divided into two equal groups.

Group A subjects underwent proprioceptive exercises and strengthening exercise programme, whereas Group B, Subjects underwent only strengthening exercise programme. The study was done for duration of 8 weeks. Following this the outcomes were measured using WOMAC scale for functional disability and TUG test for functional mobility and balance.

Student ‘t’ test was used to find out the difference between the test values. Pre test and Post test of individual group was calculated and the Post test variables

for the group was also calculated. Based on statistical analysis the subjects in Group A shows marked improvement in functional ability when compared with Group B subjects.

CONCLUSION

- There is a significant improvement in functional ability in both the groups.
- When compared with Group A (Experimental group), the Group B (control group) shows less improvement in functional ability.

So this study concludes that proprioceptive exercises along with strengthening exercises shows a significant improvement on functional ability when compared to strengthening exercise alone in patients osteoarthritis of knee.

VIII LIMITATION AND RECOMMENDATION

LIMITATIONS

- Study was done with less number of patients.
- Study was done in short duration
- Study not analysing the inter rater or Intra rater reliability
- Biasness in the exercises programme can't be controlled.
- Measurement of knee joint proprioception was not considered in the study.
- Certain factors like Medications, Life style, sleeping pattern are not modified by the patient.

RECOMMENDATIONS

- Future study should focus on other forms of exercise which improves proprioception and balance
- Similar type of study can be advised for the OA Hip joint.
- Future study should include other different techniques like MET's or Maitland.
- Long term follow-up should be made to find out the effect of the treatment.

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APPENDIX

APPENDIX I

WOMAC SCALE

Overview

The WOMAC (Western Ontario and Mc Master University) Index is used to assess patient with osteoarthritis of the hip or knees with 24 parameters.

Pain

- Walking
- Stair climbing
- Nocturnal rest
- Weight bearing

Stiffness

- Morning stiffness
- Stiffness occurring later in the day

Physical function

- Getting in or out of car
- Going shopping
- Putting on socks

- Rising from bed
- Taking of socks
- Lying in bed
- Sitting
- Standing
- Getting on or of toilet
- Heavy domestic duties
- Light domestic duties

Interpretation:

Minimum total score: 0

Maximum total score: 96

The Western Ontario and McMaster Universities Osteoarthritis Index

(WOMAC)

Name:_____

Date:_____

Instructions: Please rate the activities in each category according to the following scale of difficulty: 0 = None, 1 = Slight, 2 = Moderate, 3 = Very, 4 = Extremely

Circle **one number** for each activity.

Pain

1. Walking	0	1	2	3	4
2. Stair Climbing	0	1	2	3	4
3. Nocturnal	0	1	2	3	4
4. Rest	0	1	2	3	4
5. Weight bearing	0	1	2	3	4

Stiffness

1. Morning stiffness	0	1	2	3	4
2. Stiffness occurring later in the day	0	1	2	3	4

Physical Function

1. Descending stairs	0	1	2	3	4
2. Ascending stairs	0	1	2	3	4
3. Rising from sitting	0	1	2	3	4

4. Standing	0	1	2	3	4
5. Bending to floor	0	1	2	3	4
6. Walking on flat surface	0	1	2	3	4
7. Getting in / out of car	0	1	2	3	4
8. Going shopping	0	1	2	3	4
9. Putting on socks	0	1	2	3	4
10. Lying in bed	0	1	2	3	4
11. Taking off socks	0	1	2	3	4
12. Rising from bed	0	1	2	3	4
13. Getting in/out of bath	0	1	2	3	4
14. Sitting	0	1	2	3	4
15. Getting on/off toilet	0	1	2	3	4
16. Heavy domestic duties	0	1	2	3	4
17. Light domestic duties	0	1	2	3	4

Total Score: _____ / 96 = _____%

Comments / Interpretation (to be completed by therapist only):

APPENDIX II

Timed Up and Go (TUG) Test

Name:_____ Date:_____

1. Equipment: arm chair, tape measure, tape, stop watch.

2. Begin the test with the subject sitting correctly (hips all of the way to the back of the seat) in a chair with arm rests. The chair should be stable and positioned such that it will not move when the subject moves from sit to stand. The subject is allowed to use the arm rests during the sit – stand and stand – sit movements.

3. Place a piece of tape or other marker on the floor 3 meters away from the chair so that it is easily seen by the subject.

4. Instructions: "On the word GO you will stand up, walk to the line on the floor, turn around and walk back to the chair and sit down. Walk at your regular pace.

5. Start timing on the word "GO" and stop timing when the subject is seated again correctly in the chair with their back resting on the back of the chair.

6. The subject wears their regular footwear, may use any gait aid that they normally use during ambulation, but may not be assisted by another person. There is no time limit. They may stop and rest (but not sit down) if they need to.

7. Normal healthy elderly usually complete the task in ten seconds or less. Very frail or weak elderly with poor mobility may take 2 minutes or more.

8. The subject should be given a practice trial that is not timed before testing.

9. Results correlate with gait speed, balance, functional level, the ability to go out, and can follow change over time.

Normative Reference Values by Age

Age Group	Time in Seconds (95% Confidence Interval)
60 – 69 years	8.1 (7.1 – 9.0)
70 – 79 years	9.2 (8.2 – 10.2)
80 – 99 years	11.3 (10.0 – 12.7)

APPENDIX III

STRENGTHENING EXERCISE

The strengthening exercises was performed thrice a week of thirty minutes per session for a period of eight weeks which includes

- Warm up for 10 minutes with a stationary bicycle.
- Stretching of the hamstring muscle with the aid of elastic band done for three sets with holding of 30 seconds.
- Knee extension exercise was performed in sitting position, with the hip and knees flexed at 90ºon a quadriceps exercise table. The load used was determined based on the ten-repetition maximum test .50% to 60% of the estimated maximum load was used initially and gradually progressed based on patient tolerance. For three sets of 15 repetitions with 30 to 45 seconds intervals between each sets.

APPENDIX IV

PROPRIOCEPTIVE EXERCISES

Proprioceptive exercise protocol includes various agility and balance exercises performed by the patient were progression is made based on the patient ability. It is done thrice a week on alternate days of 30 minutes per session for eight weeks..

AGILITY EXERCISES

These exercises are always done before balance exercises which are progressed by adding more number of steps were the patients begin with 15 steps initially and progressed to the maximum of 75 steps per exercise.

Exercise	Description
Wedding march	Step forward and slightly to one side with leading foot, bring trailing foot together with leading foot, alternate leading foot to continue forward walk
Backward wedding march	As wedding march walk backward.

High knees march	Walk forward while flexing hip to 90 degrees
Side stepping	Stand with feet together step to side with leading foot, bring trailing foot back to leading foot and pepaet in opposite direction.
Semi tandem walk	Walk forward heel to toe with heel of leading foot just in front of and medial to great toe of opposite foot.
Tandem walk	As semi tandem walk the leading heel lands directly in front of the opposite foot.
Cross over walk	Walk forward bringing each foot across midline of the body.
Modified grapevine	Step to side with leading foot bring trailing foot behind the leading foot, step to side with leading, bring trailing in front, repeat in opposite direction.
Toe walking	Patient walk forward on toes.
Heel walking	Patient walk forward on heels

BALANCE EXERCISE

Balance exercises were done on the ground where the patient does the exercise in standing which is progressed based on patients ability by adding time and increasing number of repetitions completing up to three sets of thirty seconds balancing. It includes two exercises as in the table.

Exercise	Description
Static balance	Patient stands on one foot
Dynamic balance	Patient stands on one foot and does a bouncy movement by flexing and extending to 5 to 10 degrees.

APPENDIX V

CONSENT FORM

This is to certify that I ---------- freely and voluntarily agree to participate in the study **"EFFECT OF PROPRIOCEPTIVE EXERCISE AND STRENGTHENING EXERCISEON FUNCTIONAL ABILITY OF PATIENTS WITH KNEE OSTEOARTHRITIS".**

I have been explained about the procedures and the risks that would occur during the study.

Participant:

Witness:

Date:

I have explained and defined the procedure to which the subject has consented to participate.

Researcher:

Date: