A COMPARATIVE STUDY ON EFFECTIVENESS OF NEUROMUSCULAR TRAINING AND KINESTHESIA BALANCE AGILITY TRAINING ON PAIN, STRENGTH AND FUNCTION IN KNEE OSTEOARTHARITIS

[1]Dr.Kommunuri Syamala Slessy [2]Dr.Patchava Apparao

[1]MPT(Orthopedics)2nd year,.[2]Principal,

Department of Orthopedics Physiotherapy

Swatantra Institute of Physiotherapy and Rehabilitation, Rajahmundry, Andhra Pradesh, India.

ABSTRACT: Knee osteoarthritis is a degenerative joint disease, which alters the structure of the cartilage. The cartilage degenerated along with the surrounding tissues which are synovial membrane, menisci and underlying bone. Over time, knee OA will cause both pain and loss of physical function, resulting in reduced quality of life. PURPOSE: - The purpose of this study is to find the effect between Neuromuscular training and Kinesthesia Balance Agility training on improving pain, strength and functional ability in subjects with knee osteoarthritis. METHODS: - 600 subjects who were clinically diagnosed of osteoarthritis of knee were assessed and only 120 were recruited who are willing to be in the study and they were randomly allocated into two groups. In Group A (n=60) subjects were treated with neuromuscular training whereas thrice a week for 8 weeks, where in Group B (n=60) subjects were treated with kinesthesia balance agility training with conventional exercises. The outcome of this intervention was knee pain, and disability index (KOOS) and lower limb strength (knee flexion and extension) these were recorded before and after the session of 8weeks intervention. CONCLUSION: - It was concluded that neuromuscular training and KBA training are equally effective in reducing pain but neuromuscular training is more effective in improving strength (Dynamometer) and function(KOOS) when compared with KBA training.

***Key words*: Knee Osteoarthritis; strength; KOOS;ADL;QOL Neuromuscular training; KBA**.

I. INTRODUCTION

Knee osteoarthritis (OA) is a degenerative joint disease, that changes the structure of the cartilage[1,3]. The cartilage degenerates with the surrounding tissues, i.e the synovial membrane, the menisci and the underlying bone. Over time, knee osteoarthritis will result in both pain and loss of physical function, resulting in reduced quality of life[2] According to W.H.O definition of osteoarthritis is a disease of the entire joint involving the cartilage, joint lining, ligaments, and underlying bone the breakdown of these tissues eventually leads to pain and stiffness.[4]

Globally, there were an estimated 241 million cases of osteoarthritis in 2013, an increase of 71.9% from 1990.5 The global prevalence of age-standardized knee osteoarthritis was 3.8 % in 2010 . Hypertension of the hip and knee was ranked 11th among the 291 persons with a global disability6. About one-third of people with knee osteoarthritis will progress to more advanced disease7,8, which is the primary indication for knee replacement surgery. In India, according to the adult rural population, it was estimated at 5.8% among the elderly and 16.4% was estimated. The

annual consultation rate for osteoarthritis has increased by 15 million in India10: by 2020, the number of people aged 65 and over in India is expected to reach 77 million, while India has 100 million in 2010.9
The onset and progression of knee osteoarthritis depend to a large extent on mechanical factors, such as excessive joint load, abnormal knee joint load, or a combination of both. Overload of the knee joint may be caused by acute overload trauma (for example, LCA13 rupture, chronic with obesity14,15 or structural degeneration related to osteoarthritis of the knee causing meniscal tears and misalignment) 11 Abnormal knee joint loads caused by abnormal anatomy of congenital or acquired origin (eg, partial meniscectomy) 16 may result in increased focal stress on a certain part of the joint.
Primary osteoarthritis is idiopathic and secondary osteoarthritis is caused by endocrine, inflammatory, metabolic and genetic diseases, etc. It occurs mainly in the elderly characterized by erosion of articular cartilaginous hypertrophy in the margins of the disease. alteration of the synovial membrane and joint capsule. Clinical features include pain, swelling, gait, stiffness, decreased range of motion. According to Yolanda Smith. Osteoarthritis is a generative joint disease that involves the breakdown of joints, articular cartilage and subchondral bone following mechanical stress in the area. The diagnosis is made with certainly based on history and clinical examination17,18. X-rays can confirm the diagnosis. Typical radiographic changes include narrowing of the joint space, subchondral sclerosis (increased bone formation around the joint), formation of subchondral cysts, and osteophytes19. and arthroscopy20.
Historically, the diagnosis and severity of knee osteoarthritis is based on structural changes observed on standard radiographs of the tibiofemoral joint. Knee x-rays are commonly classified by the Kellgren and Lawrence classification system21,22. However, X-rays have been shown to be an imprecise guide for the diagnosis of knee osteoarthritis, due to the poor correlation between pain and structural changes23,24. conservative by drugs and physiotherapy. Analgesics and anti-inflammatories are widely used in treatment25. Current evidence suggests that NSAIDs may be beneficial in reducing pain in the short term, but there is no support for long-term use26
In patients with severe osteoarthritis of the knee, they are eligible for unilateral total knee arthroplasty to allow for increased flexion by incorporating posterior femoral condyle extension, with modification of the tibial spine, prolonging the posterior femoral condyles ; , allowing posterior translation of the femur and flexion beyond 120 ° without tibio-femoral conflict. An increased bending offset is achieved by removing an additional 2 mm of bone from the posterior femoral condyles to accommodate the thicker condyles of the femoral component27,28.
A neuromuscular exercise program that focuses on optimal alignment of the trunk and lower limb joints, as well as the quality of performance movement while dynamically and functionally strengthening the lower limb muscles, can reduce knee load. based on biomechanical and neuromuscular principles and aims to improve sensorimotor control and achieve compensatory functional stability. Sensorimotor control is the ability to produce controlled movement through coordinated muscle activity, and functional stability (also known as dynamic stability) is the ability of the joint to remain stable during physical activity.
Kinesthetic Balance Agility (KBA) exercise programs are designed to decrease proprioceptive impairment by using agility and balance movements to activate, challenge and adapt the propriocepts of the nervous system. Decreasing the proprioceptive deficit would thus increase the dynamic stability of the knee and improve activities of daily living. In addition, joint instability and joint laxity of the frontal plane were cited as a likely causal factor in the development of knee osteoarthritis and more. Proprioceptive acuity, ie, awareness of joint position, joint movement (kinesthesia), and the sense of resistance, have been established[31].

II.METHODOLOGY

It is a Prospective cohort study with Systemic random sampling. The study was conducted at Out Patient Department of Physiotherapy, GSL Medical College and General Hospital, Rajamahendravaram, Andhra Pradesh, India. The study was conducted during the period between April 2017 and April 2018**.** 8 weeks of training programme which includes KBA training in control group and Neuromuscular training in Experimental group. A total number of 600 knee osteoarthritis subjects were screened of in that 120 subjects were recruited who are willing to participate in the study, obtaining the consent form from the patients who met the inclusion criteria. These 120 subjects were randomized into two groups 60 subjects in each group.

2.1 INCLUSION CRITERIA (i) Participants with diagnosis of primary knee Osteoarthritis having a symptom of pain and at least three features of the following six items can be classified as OA knee according to the American College of Rheumatology Criteria (ii) Stiffness followed by rest and early morning joint stiffness. (iii) Early Morning stiffness for about 30 minutes. (iv)Tenderness and enlargement of bone with crepitus. (v)No warmth on palpation. (vi) Symptoms more than 3 months. (vii) Subjects who are able to walk on heels and toes .(viii) Age between 45 to 65 yrs both genders. (ix) Grade 2 and 3 Primary Osteoarthritis diagnosed by an Orthopeadician.

2.2EXCLUSION CRITERIA (i) Any history of knee, hip and ankle surgery prior to the study. (ii) Any local or systematic infection. (iii) Mentally deficits patients.(iv)Any deformities in the lower limbs.(v) Limb length discrepancy. (vi) Any intra articular injection to the knee.

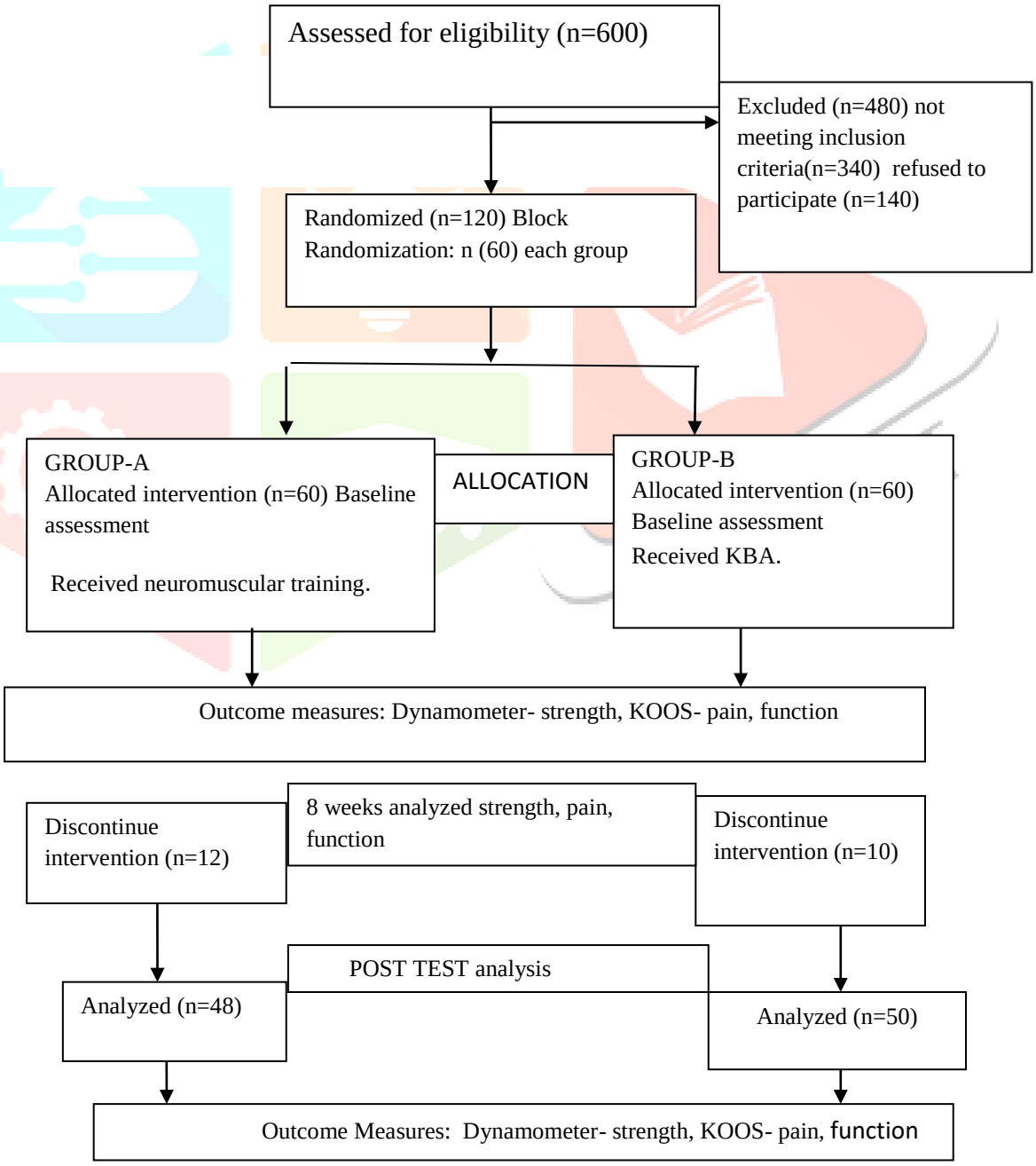
2.4 TREATMENT PROTOCOL

2.4.1 GROUP A: Received neuromuscular training along with warm-up for 60min, 3days per week for 8weeks

2.4.2 GROUP B: received Kinesthesia Balance and Agility training of 50min, 3days per week for 8weeks

2.5 OUTCOME MEASURES: Strength- Measured by Hand Held Dynamometer, Function- Measured by KOOS Score

FLOW CHART OF RANDOMIZATION AND INTERVENTION



IV. STATISTICAL ANALYSIS: Statistical analysis was performed using MS Excel 2007 and SPSS software version 20.0. Descriptive statistical data has presented in the form of mean ± Standard deviation and mean difference percentage were calculated and presented. The statistical significance was set at $p< 0.05$ with 95% confidence intervals.

V. RESULTS:

Table:1 Analysis of mean scores of Knee Strength within the Groups

Parameters		Measurement	Group-1		Group-2		p-value	Interference
Knee strength	Knee flexors		Mean	SD	Mean	SD		
		Pre test	8.09	2.31	8.42	1.803	0.000	Significant
		Post test	14.73	2.155	13.49	1.682	0.000	Significant
	Knee extensors	Pre test	9.33	2.735	9.9	1.739	0.000	Significant
		Post test	15.79	1.996	14.43	1.607	0.000	Significant

Graph :1 Comparison of mean score of knee strength within the groups

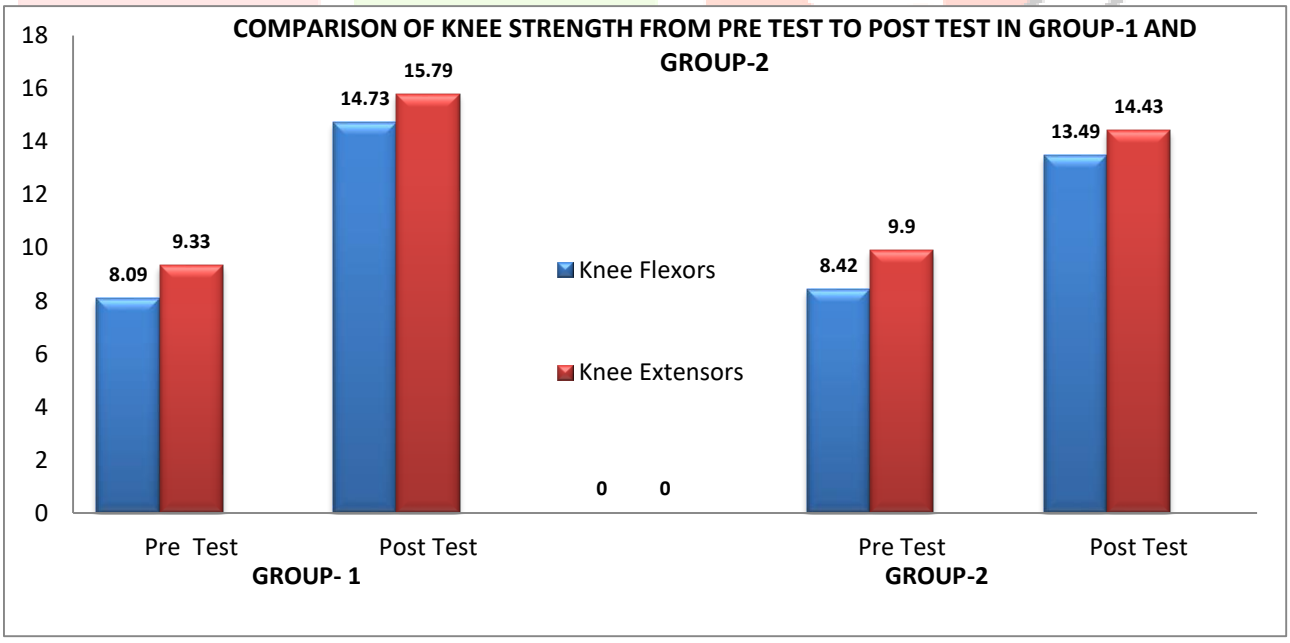
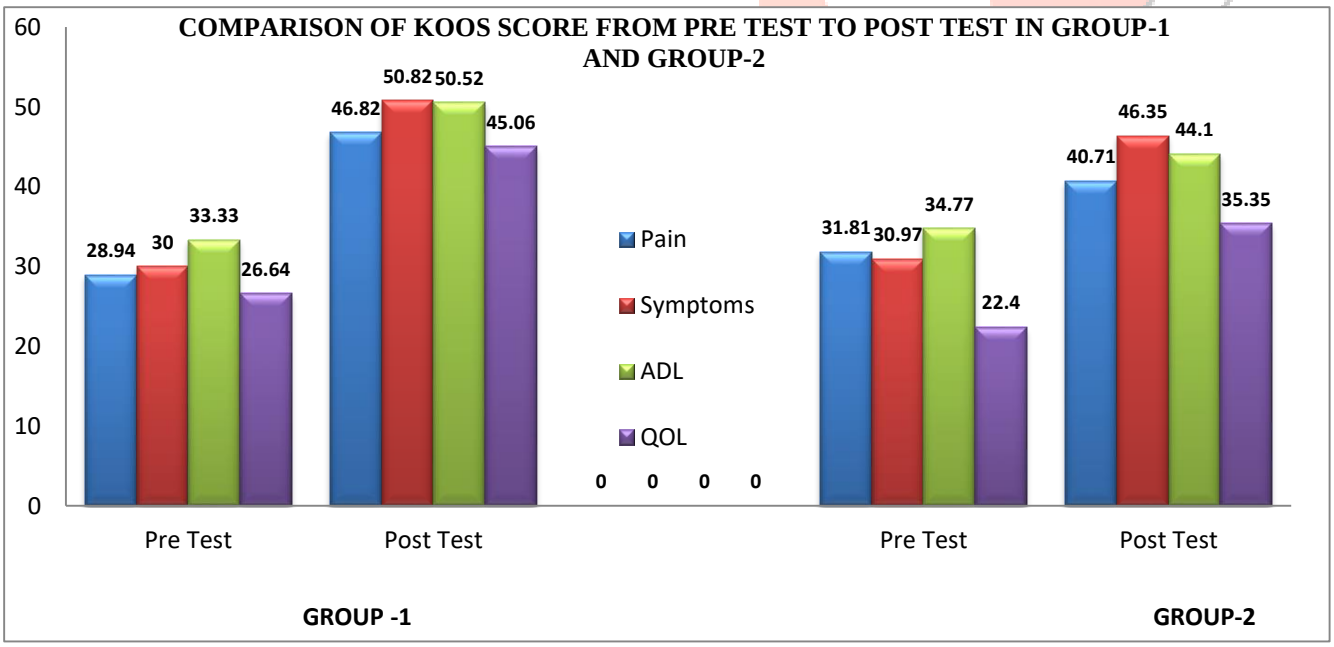


Table: 2 Analysis of mean scores of KOOS components within the Groups

Parameters		Measurement	Group-1		Group-2		p-Value	Interference
			Mean	SD	Mean	SD		
KOOS Score	Pain	Pre test	28.94	10.888	31.81	11.415	0.000	Significant
		Post test	46.82	13.46	40.71	11.495	0.000	Significant
	Symptoms	Pre test	30.00	21.535	30.97	14.345	0.000	Significant
		Post test	50.82	16.158	46.35	17.285	0.000	Significant
	ADL	Pre test	33.33	12.633	34.77	11.575	0.000	Significant
		Post test	50.52	10.323	44.10	11.247	0.000	Significant
	QOL	Pre test	26.64	10.377	22.45	7.279	0.000	Significant
		Post test	45.06	12.344	35.35	9.142	0.000	Significant

Graph :2 Comparison of mean score of knee strength within the groups



VI. DISCUSSION The present study was to evaluate the effectiveness of Neuromuscular training (Group 1) and Kinesthesia Balance Agility training (Group 2) on improving function, and strength in subjects with Osteoarthritis of Knee. In this study subjects were assessed for knee pain, strength, and function. Dynamometer and KOOS score were used to quantify the intensity of knee pain, strength, and physical function. There is significant difference in Dynamometer and KOOS score in all subjects after 8 weeks treatment with neuromuscular training and kinesthesia balance agility training. There are a total of 22 drop outs in the study, 12 in GROUP-A and 10 in GROUP-B. The result of the study in Neuromuscular group is mainly based on the sensorimotor system**.** Sensorimotor dysfunction may also play a role in the development and progression of degenerative knee disease. The neuromuscular training method is based on biomechanical and neuromuscular principles and aims to improve sensorimotor control and achieve compensatory functional stability. It is the ability to produce controlled movement through coordinated muscle activity, and functional stability.The result of the study shows that Neuromuscular training is more effective than KBA training to improve the pain, Strength and functional ability of OA knee patients. The improvement in Group l is more than Group 2 and is statistically highly significant. Loss of proprioception that can be showed from OA knee patients was reported as a cause of diseases and as a factor of progress and it will be effective to reduce pain and disability progress strength of OA knee. In conclusion, patients who have knee osteoarthritis need to improve muscle power, proprioception. We think that designing appropriate exercise programs create effective result. Between group analysis has shown that that there is no statistically significance difference between Neuromuscular and KBA group is symptoms, but there is a significant difference in improving strength and ADL, QOL and decreasing pain after 8 weeks of intervention for subjects with OA knee Both the groups has shown improvement in the symptoms and mainly Neuromuscular have shown more improvement in strength, function (ADL,QOL) and decreasing of pain when compared with KBA, because as neuromuscular have more activity and strengthening which improve sensiromotor control and achieve compensatory stability than KBA.

LIMITATIONS: (i)Small sample size. (ii) Lack of control group in the present study (iii)Subjects could not be followed up for longer period

VII. CONCLUSION - It was concluded that neuromuscular training and KBA training are equally effective in reducing pain but neuromuscular training is more effective in improving strength (Dynamometer) and function(KOOS) when compared with KBA training.

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