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EFFECTIVENESS OF STRENGTHNING OF CHIEF PELVIC STABILIZER ON FUNCTIONALITY IN OSTEOARTHRITIS KNEE

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ABSTRACT

BACKGROUND: Osteoarthritis knee is the most common degenerative condition affecting the age greater than 40 years leading to pain, functional disability and muscle weakness. Physiotherapists have been exploring different forms of exercise intervention, like conventional exercise, resisted exercise, aerobic exercise etc. Despite the number of studies showing evidence on particular intervention towards outcome measure, evidences are still needed for proving usefulness chief pelvic stabilizer i.e. hip abductor muscle strengthening as a treatment for of OA knee patients.

OBJECTIVE: To evaluate the efficacy of chief pelvic stabilizer i.e. hip abductor muscle strengthening exercises on functionality in patient with OA knee.

INTERVENTION: 58 individuals with OA knee were included and allocated to two groups (n=29 in each group). Groups were administrated with hip abductor strengthening exercises along with Conventional therapy and Conventional therapy alone for 4 weeks (5 days per week). TUG test was used to assess changes between baseline and post intervention.

RESULTS: The experimental group (Group A) was associated with significant greater change in TUG score compare to control group (Group B).
CONCLUSION: Strengthening of pelvic stabilizer increases functionality in OA knee, so it has additional beneficial effect in comparison to control group specific over functionality in OA knee.
KEYWORDS: OA Knee, hip abductor strengthening, conventional exercises, TUG**.**

Introduction

Hip muscle weakness occurs as consequence of OA knee and mechanism behind it is same as quadriceps weakness. i.e. because of pain functionality is reduced that lead to less activation of muscle causing atrophy of muscle fibers leading to muscle weakness [1,2,3]. People with knee OA demonstrate significant weakness of the hip musculature. Hip abductor muscle weakness leads to impaired control of pelvis in frontal plane which results in drop of pelvis towards opposite side which ultimately results into shifting of center of mass away from the stance limb towards swing side. That causes excessive loading at medial knee joint of stance limb which results in pain and functional abnormality [2, 4]. Weaker hip abductors associated with lower external hip rotation moment on the osteoarthritis stance limb would result in additional pelvic drop of the contralateral swing limb, shifting the body's COG towards swing limb. This would lengthen the lever arm at the osteoarthritc knee, thus increasing medial knee load provoking the disease progression

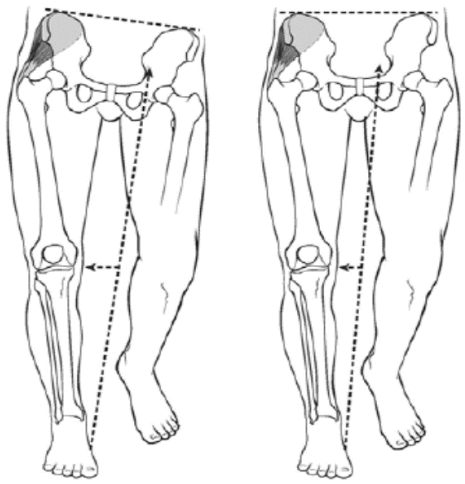


Fig 1: Hip abductor weakness leading to increase stress at medial compartment of knee joint (2)

Hinman *et al* concluded that People with knee OA demonstrate significant weakness of the hip musculature. Findings from this study support the inclusion of hip strengthening exercises in rehabilitation programs (3). Zhang *et al* concluded that weakness of hip abductor in OA knee leading to shifting of pelvis on contralateral side. That causes more loading of medial knee joint causing provocation of the condition (5). K.L. Bennell *et al* concluded that isolated strengthening of the hip muscles improves symptoms and functionality in the patients with OA knee (6, 7, 8). Shakoor N. *et al* concluded that significant improvements in knee pain and functionality in the patients with OA knee following the standard quadriceps strengthening exercise. Khalil Khayambashi *et al* concluded that hip abductor strengthening is effective in improving pain and health status compare to quadriceps strengthening in female with PFPS(8). So the incorporation of hip abductor strengthening should be considered while designing a rehabilitation protocol.

Methodology

PROCEDURE OF THE STUDY:

- STUDY DESIGN: Experimental
- STUDY DURATION: 1 Year
- STUDY POPULATION: Patients with Osteoarthritis of knee joint
- SAMPLING TECHNIQUE: Purposive random sampling
- SAMPLE SIZE CALCULATION

Sample size was calculated on G*power software. Based on previous studies estimated sample size of 25 participants in each group. By taking into account a probable 15% drop out rate, the sample size is increased by 4 patients in each group – 29 participants per group; so total 58 patients were included in this study.

- **INCLUSION CRITERIA**
  - Age 40 to 65 years.
  - Both Male and Female
  - Patient with knee pain, crepitation, stiffness of joint.
  - Average knee pain >4 on an 11-point scale [NPRS] (0 =no pain; 10 = maximal pain)
  - Patient with Grade- 2 & 3 OA knee as per Kellgren-Lawrence classification.
  - BMI should be within this range: 18.5 to 24.9.
- **EXCLUSION CRITERIA**
  - Any inflammatory arthritis
  - Patients who have taken intra-articular corticosteroid or hyaluronic injections within last 6 months,
  - History of hip or knee joint replacement or tibial osteotomy,
  - Unable to ambulate without assistive device.

TOOLS AND MARERIALS USED

- Weighing Scale
- Measure tape
- Stopwatch
- Informed consent form
- Data recording sheet

PROCEDURE

GROUP-A (EXPERIMENTAL GROUP)

- Hip abduction in side lying
- Isometric hip abduction
- Hip abduction in standing
- Along with these exercises subjects in experimental group also received the **conventional** exercise as described in **GROUP – B**.

GROUP-B (CONTROL GROUP) [11]

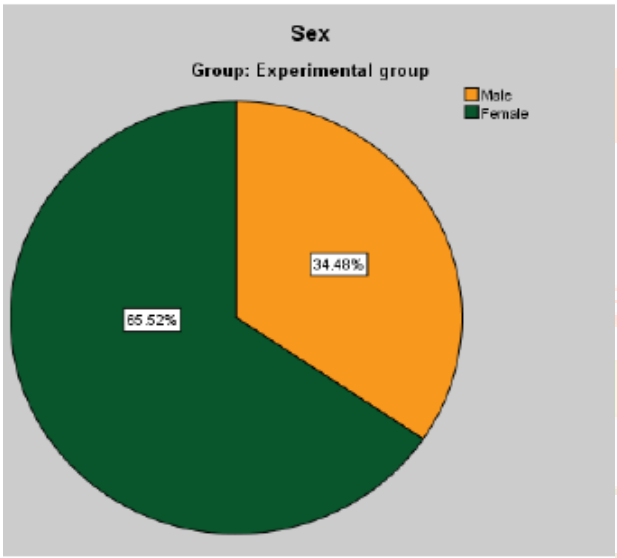
- Static quadriceps exercise
- VMO strengthening exercise using boister
- Terminal knee extension in high sitting position
- Outer range knee extension exercise
- Inner range knee extension exercise

Outcome

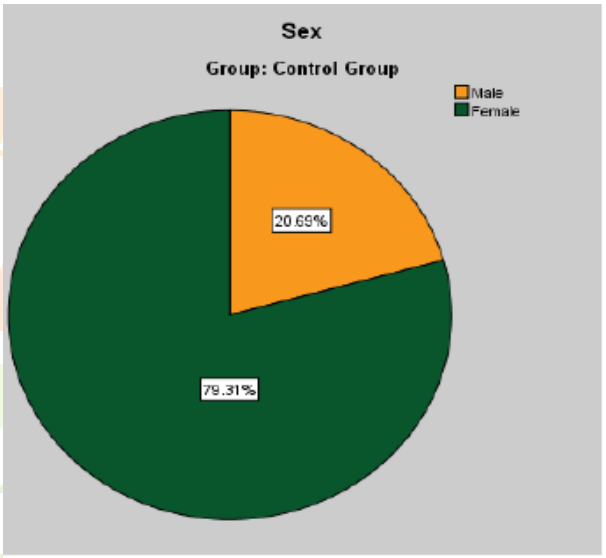
The TUG assesses basic mobility skill as well as strength and agility. The TUG is used in the population ranging from children to the elderly and for many conditions, including osteoarthritis (OA) of hip and knee, cerebral stroke, cerebellar ataxia etc. Time (seconds) taken to rise up from sitting in an armchair, walking 3 meters, turning, walking back to the chair, then sitting down using regular footwear [41, 42]. It is highly reliable as it has ICC 0.95–0.97 [41].Patients were given command to sit in erect position and then to get up on command and to walk up to the given distance as well as in given directions.Time taken by the patient to complete the task was noted.

DATA ANALYSIS AND RESULTS

- **IBM SPSS version 20.00** was used for Data Analysis.
- **Normality** was checked by **Shapiro wilk Test**.
- **Baseline** was checked by **Mann whitney U-Test.**



Graph-1: Demographic Data in Experimental Group



Graph-2: Demographic Data in Control Group

Table 1: Normality Test

OUTCOME	p Value by (Shapiro-Wilk test)
TUG	0.00

As the p values for all the outcome is less than 0.05 (<0.05) that indicates data are not normally distributed.

Table 2: Baseline Equality

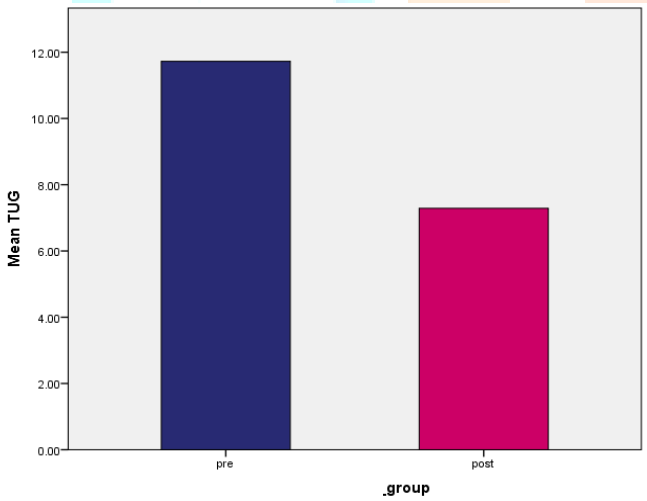
OUTCOME	p Value by (Independent samples Mann-Whitney U test)
TUG	0.087

- As the data are not normally distributed non-parametric test (independent samples Mann-Whitney U test) for baseline assessment has been used.
- As the p values for all the outcome is greater than 0.05 (>0.05) that indicates Baseline for TUG outcome is equal.

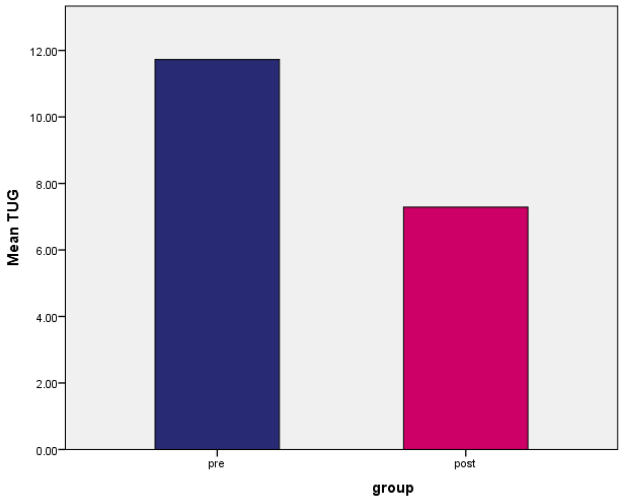
Table 3: Within Group Comparison Related sample Wilcoxon Signed Rank test

Variable	Level	Mean±SD	Z value	P value
TUG	Base	11.72±1.82	-4.70	0.00
	4th Week	7.29±1.46		
	4th Week	1.21±0.18		

Result shows significant difference between baseline and 4th week ($p < 0.05$) in both the groups



Graph-3: Pre-Post TUG Score in Experimental Group



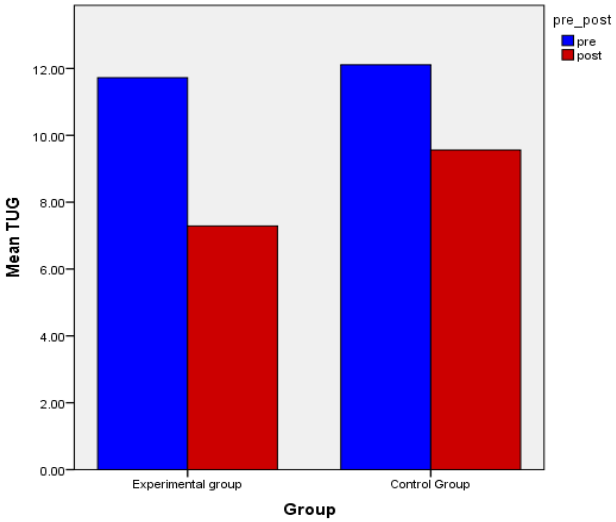
Graph-4: Pre-Post TUG score in Control group

Table 4: Between Group Comparison Independent Sample Mann –Whiteney U test

Variable	Level	Mean±SD (Experimental group)	Mean±SD (Control group)	t value	P value
TUG	Base	11.72±1.82	12.11 ±1.21	-6.48	0.00
	4th Week	7.29±1.46	9.56 ±1.30		

Result shows significant difference between two groups at the end of the 4th week as $p< 0.05$.

Mean ± SD of TUG of experimental group at 4th week is less than control group. That indicates TUG is decreased more in experimental group compare to control group**.** So, statistically improvement in TUG score is more in experimental group.



Graph-5: between Groups comparison of Pre-Post TUG Score

DISCUSSION

As earlier mentioned in result between groups comparison was done by using independent sample Mann Whitney U test for hip abductor torque. That shows significant difference in experimental and control group. As mean of hip abductor torque of experimental group at 4th week is 2.00±0.43 of hip abductor torque of control group at 4th week 1.21±0.18.So, experimental group shows better statistical and clinical improvement (Table - 4).The result showed remarkable improvement in Hip abductor Torque in experimental group compare to control group. Results showed clinically significant improvement in hip abductor strength As MDC for hip abductor torque – 0.07.So, Pelvic stabilizer should be included in protocol of OA knee in order to improve hip abductors strength which has a greater impact in stabilization of pelvis. In this way the Biomechanical load over the medial compartment of Knee joint can be reduce, which helps in delaying of progression of the condition.

Khalil Khayambashi et al [8] checked the effectiveness of isolated hip abductor and external rotator strengthening in subjects with patella-femoral pain syndrome. They had taken two groups. First one experimental group received hip strengthening exercises and other group was control group with no intervention. That study revealed that hip strengthening exercises
Significantly decreases pain and improves health status compare to control group. When we
Compare the baseline results of experimental group of Present study with this study there was no
Significant difference. But the present study reveals that hip abductor strengthening along with
conventional exercises improves hip abductor strength, functionality and reduces pain in 4 weeks only Both Where as in this study they have mentioned the improvement in condition in 8weeks and follow up of 6 months. So, present study shows improvement earlier compare to this study.

Chang et al studied that weaker hip abductors associated with lower external hip rotation moment on the osteoarthritic stance limb would result in additional pelvic drop of the contralateral swing limb, shifting the body's COG towards swing limb. This would lengthen the lever arm at the osteoarthritc knee, thus increasing medial knee load provoking the disease progression[17].On the bases of that K.L.Bennell et al did study on hip abductor strengthening to check external hip adduction moment, pain and functionality[15]. The results of their study concluded that hip strengthening reduces the pain, improves functionality and improve muscle strength in 13 weeks of intervention. Where as in present study all this benefits i.e. reduced pain ,improved functionality, improved muscle strength occurs with combined hip abductor strengthening and conventional exercise i.e. quadriceps exercise within 4 weeks only. Elizabeth Sled et all checked the effect of home exercise program of hip abductor exercise in OA knee.40 subjects were recruited for experimental group and were asked to perform exercise 4 times per week up to 8 weeks. results of this study shows improvement in strength, functionality ,reduces pain at the end of the 8 week and it is also compare with the control group i.e. group with no intervention[14]. Where in present study comparison is done between two groups in which both groups are receiving conventional therapy but experimental group was receiving additional hip abductor strengthening program. Positive results were obtained within 4 weeks.

Hip abductor weakness is associated in OA knee and mechanism behind that is same as quadriceps weakness that is because of pain functionality is reduced. That causes atrophy of the muscle fiber leading to weakness of hip abductors. That results in additional pelvis drop on the contralateral side, shifting the body's COG towards contralateral side increasing medial knee load provoking the disease[17]. So, by strengthening the hip abductor muscle further provocation of the condition can be delayed; symptoms can be reduced and functionality can be improved.

LIMITATION

- Result cannot be generalized to entire OA knee population as this study is having criteria regarding age, BMI, grade of OA.

Future Recommendation

- As this RCT is focused over only one outcome i.e. proprioception, agility or other object based functional outcome in the next studies importance of Pelvic stabilizers on other outcomes can be checked.
- The study should have a follow up in order to evaluate the consistency of effectiveness of hip abductor strengthening exercise that is maintained or not over the period of time.

CONCLUSION:

- This study reveals that hip abductor strengthening can be considered for the treatment of OA knee. As hip abductor strengthening along with conventional therapy improves TUG score, So Pelvic stabilizer should be included in protocol of OA knee in order to improve functionality which has a greater impact in stabilization of pelvis. In this way the Biomechanical load over the medial compartment of Knee joint can be reduce, which helps in delaying of progression of the condition.

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