



ORIGINAL ARTICLE

## To study the effects of knee osteoarthritis on hip flexibility among elders.

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**ABSTRACT... Objectives:** To determine the effect of knee osteoarthritis on hip flexibility by using Modified Thomas Test. **Study Design:** Observational study. **Setting:** Department of Physiotherapy and Orthopedic, Shalamar Hospital, Lahore. **Period:** 1 July 2021 to 31 December 2021. **Material & Methods:** This study recruited 40 participants of either sex, age between 30- 70 years. **Results:** The response of study was 100%. Frequency of females with osteoarthritis was 82.5 males was 17.5%. Among the patients 33 were females and 7 were males. T-Test was performed for parameters of age in years, height in inches, weights in kgs for females and males. The mean age was 51.79±9.303 years for female and 55.43±8.404 years for male. Weight in kgs for female was 76.03±9.133 and for male was 94.57±20.911. In T test the height in inches for female was 61.45±2.399 and for male was 65.57±3.735. The co-relation between hip flexibility and knee osteoarthritis was moderately significant and flexibility was reduced because of osteoarthritis. **Conclusion:** It was concluded that hip flexibility is reduced with osteoarthritis of knee joint and due to reduced mobility of hip joint routine daily activities of patient was hampered.

**Key words:** Elderly, Flexibility, Knee Osteoarthritis, Modified Thomas Test, Osteoarthritis.

### INTRODUCTION

Hip joint and Knee joint, being the most essential part of the lower limb in the body to carry out the functional activities of daily living and in ambulation and transfers. These joints therefore are more prone to overuse injuries. Osteoarthritis (OA) of these joints is common among old age, and it has a significant impact on their quality of life. The most frequent type of osteoarthritis is knee osteoarthritis. Knee OA is a leading cause of pain, disability, and economic loss among old age around the world.<sup>1</sup> Patients with knee OA have a poor functional capability, which can be related to joint discomfort, stiffness, and a loss of lower extremity muscle strength. Although OA is diagnosed and defined as a loss of hyaline cartilage in the joint, muscle deficits linked with the disease could be the major source of functional limitation.<sup>2</sup>

Epidemiology of OA is multifaceted and complicated, including genetic, biochemical,

and biomechanical components. Incidence of knee osteoarthritis was 203 per 10000 and this data also shows the burden of osteoarthritis on health system.<sup>3,4</sup> It is estimated that roughly 60 million people in the United States are affected by osteoarthritis, and it is the largest cause of disability among those over 65 years of age. Because of osteoarthritis, over 100,000 persons in the United States are unable to walk from their bedroom to their bathroom due to reduced muscle strength, disturbed body perception and joint dysfunction.<sup>5,6,7</sup>

Imbalance between the muscles may arise when a person have tight hip joint musculature which ultimately leads to injury. Due to the hip flexors and quadriceps overworking to compensate for weak muscles it may frequently causes fatigue and reduction in strength eventually cause knee and hip pain. Muscular dysfunction cause further cartilage degradation and accelerate it.<sup>8</sup>

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As a result, knee OA cannot be considered purely a cartilage disease, and therapeutic care of the condition must include account for accompanying muscle deficits. Furthermore, the hip's range of motion (ROM) would be Restricted.<sup>7</sup>

Joint or a group of joints flexibility refers to its capacity to move through an unconstrained, pain-free range of motion. Although flexibility varies greatly from person to person, certain minimum ranges are required for joint and overall health. Injury, inactivity, and a lack of stretching are all factors that contribute to the loss of normal joint flexibility. The mobility of the soft tissues that surround the joint will affect the range of motion.<sup>9</sup> Soft tissues include muscles, ligaments, tendons, joint capsules, and skin all are the factors responsible for flexibility. Stretching insufficiently, especially when accompanied with activity, can result in fatigue-induced soft tissue shortening over time. The modified test is a flexibility test, measuring hip flexibility, specifically of the iliopsoas and quadriceps muscles.<sup>10</sup>

Several factors affect the flexibility of hip joint which includes age, gender, structural changes, body weight, BMI, connective tissue disorder. Common problems, in which the knee joint may be troubled, include osteoarthritis, rheumatoid arthritis, ankylosing spondylitis, bone fracture, developmental anomalies, Perthe's disease and trochanteric bursitis. Ambulation and transfers can be done due to activation of various muscles which include psoas major, Iliacus rectus femoris, hamstrings, biceps femoris.<sup>11</sup>

Hip strength is critical in patients suffering from chronic osteoarthritis of knee joint. Patients with patella femoral discomfort have substantial weakness in their calves. During sitting hip flexion strength. Test findings shows that hip joint musculature was unable to maintain the femoral rotation during daily life activities like walking, running and standing. Hip flexor weakness was enough to give instability in PFPS and cause swaying of pelvis and instability of hip joint. PFPS is one of cause of anterior knee pain and mostly affects young females and athletes without any structural changes.<sup>12,13</sup> To avoid the pelvis

swaying, maintain a steady pelvis during stride. Furthermore, the iliopsoas muscle is a secondary Muscle. Weakness in the femoral external rotator may allow the femur to move to be in a state of relative internal rotation, causing misalignment in the patella and the trochlear groove. It has been proposed that pain may be caused by patellar subluxation during weight bearing. The femur turning beneath the knee may cause activity limitation.<sup>14</sup>

The iliacus, psoas major, rectus femoris, and tensor fasciae latae (TFL) are all tested using the modified Thomas test.<sup>10</sup> Despite the fact that the modified Thomas test has been widely employed. During the modified Thomas test, the lumbar vertebrae are immediately moved into more extended positions when the hip flexor muscles are short and the degree of anterior pelvic tilt is raised. As a result, one of the most important issues for test-retest reliability is lumbo-pelvic stability. Although various studies have looked into the reliability of the modified Thomas test, no studies have looked into whether lumbo-pelvic stabilization can affect test-retest reliability.<sup>14,15,16,17</sup>

The Modified Thomas Test (MTT) is a unique observational clinical test for posture, and lower extremity kinematics that is widely used. It directly provides information about hip and knee flexibility iliopsoas, rectus femoris, sartorius and Tensor Fasciae Latae. The test is frequently used. It is used to assess passive range of motion (ROM) in clinical settings. However, because it is founded on something, it is frequently subjective. Hip flexibility in knee osteoarthritis patients is mainly affected because the patient does not move the limb because of the fear of pain, muscles being inactive they become tight and cause limited movements in daily activities.<sup>18</sup>

The effect of muscle tightness on hip can be assessed. The side where there is increased limitation was released and the Modified Thomas Test was performed then to check the effect of release. After the release all the angles of hip flexion and knee flexion were measured. He concluded that the length of iliopsoas was increased which is a hip flexor after releasing the

quadratus lumborum.<sup>19</sup>

## MATERIAL & METHODS

This observational Study was carried out in Department of Orthopedics and Department of Physiotherapy of Shalamar Hospital, Lahore. This study was conducted from 1<sup>st</sup> July 2021 to 31<sup>th</sup> December, 2021 after approval from institutional review board (SSAHS-IRB/AL/29/2022). The sample size was 40 and purposive Sampling Technique was used for the recruitment of participants.

Modified Thomas test was used to measure the flexibility of hip joint by an appropriate positioning and indicates the tightness of hip flexors (iliopsoas, rectus femoris, quadriceps). Goniometer was used as a measuring tool having a fulcrum and two arms. One is moveable and placed along the moveable extremity and the other is fixed arm which is placed along the fixed extremity during measurement. It is used to measure the angles between the joints and the ranges of motion of all the joints of body. It is available in various sizes according to the size of joints.

Patients having age between 30-70 years, known case of knee osteoarthritis, BMI 25-30 in range and having active lifestyle were included in this study. Patients having history of recent trauma and any musculoskeletal injury, any neurological impairment, autoimmune disease and having cancer were excluded from this study.

Subjects were recruited on the basis of inclusion and exclusion criteria. Prior to the training, subjects were provided a written consent. Each subject had completed a baseline Performa and perform Modified Thomas Test. The subject were asked to sit at the edge of the testing couch, then rolled back onto it while drawing both knees to the chest. This ensured that the lumbar spine is flat on the testing couch and the pelvis is turned posteriorly. The subject then lowered the affected limb to the floor while holding the opposite hip in maximum flexion with the arms. A goniometer (measuring device) was used to measure two angles on each side. The angle of hip flexion was the first angle which was measured (reflected

the length of the iliopsoas). The goniometer's stationary arm was aligned with the pelvis' lateral midline. The lateral epicondyle served as a reference point for aligning the moving arm with the femur and midline. The knee flexion angle was the second angle which was measured (reflected the length of the rectus femoris). The stationary arm was used for this measurement. Readings after this procedure were recorded and documented.

The data was collected and analyzed by SPSS 22.0 version. Frequencies were calculated for qualitative data (such as gender) whereas mean and standard deviation were computed for quantitative variables. Co-relation between hip flexibility and knee osteoarthritis was observed by using Modified Thomas Test. The T-test was applied to know the difference between qualitative variables (gender). A p-value > 0.05 indicates that the data is normal or symmetrical whereas a p-value < 0.05 indicates that the data is asymmetrical. Chi-square test was used to assess the correlation between variables. Independent t-test was used for between group difference and Paired Sample t-test was used for with-in group difference. One sample t-test used for the cut-off value. A p-value < 0.05 is considered significant whereas a p-value > 0.05 is considered insignificant.

## RESULTS

The response of study was 100%. Frequency of females with osteoarthritis was 82.5% and frequency of males was 17.5% among the patients 33 were females and 7 were males as shown in Table-I.

T-Test was performed for parameters of age in years, height in inches, weights in kgs for females and males. The mean age was  $51.79 \pm 9.303$  for female and  $55.43 \pm 8.404$  for male. Weight in kgs for female was  $76.03 \pm 9.133$  and for male is  $94.57 \pm 20.911$ . In T test the height in inches for female is  $61.45 \pm 2.399$  and for male is  $65.57 \pm 3.735$  as shown in Table-II.

T-test was performed on two pairs. In pair 1 the mean of knee flexion in unaffected population was

128.18±4.945 and the mean of knee flexion in affected population was 83.83±13.095. In pair 2 the mean of knee flexion of unaffected population was 119.13±5360 and the mean of knee flexion of affected population was 87.93±16.334. Paired sample T-test was performed on two pairs. Pair 1 the mean of knee flexion of unaffected population and knee flexion of affected population was 44.350±14.577. In pair 2 the mean of hip flexion of un-affected population and hip flexion of affected population was 31.200±14.690 as shown in Table-III.

One sample T-test was performed and the mean of knee extension of affected population was 41.40±15.884.

The mean of age of overweight population was 55.06±8.629 and the mean of age of obese population was 50.67±9.249. The mean of weights in kgs of overweight population was 68.00±4.290 and the mean of weight of obese population was 86.79±12.532. The mean of height in inches of overweight population was 61.38±2.363 and the mean of height of obese population was 62.71±3.394 as shown in Table-IV.

The mean of duration of taking medicines of overweight population was 15.50±14.311 and the mean of duration of taking medicines of obese population was 14.50±11.182. The mean of knee flexion of unaffected overweight population was 127.06±5.531. The mean of knee flexion of unaffected obese population was 128.92±4.481 as shown in Table-IV.

The mean of knee flexion of affected overweight population was 82.38±14.555 and the mean of knee flexion of affected obese population was 84.79±12.254. The mean of hip flexion of unaffected overweight population was 116.75±6.465 and the mean of hip flexion of unaffected obese population was 120.71±3.862. The mean of hip flexion of affected overweight population was 84.56±16.654 and the mean of hip flexion of affected obese population was 90.17±16.080 as shown in Table-IV. The mean of knee extension of affected overweight

population was 41.19±19.542 and the mean of knee extension of affected obese population was 41.54±13.368 as shown in Table-IV.

Gender	Frequency (%)
Male	7 (17.5%)
Female	3 (82.5%)
Total	40 (100.0%)

Table-I. Frequencies

Variable	Male		Female		P-Value
	N	Mean	N	Mean	
Age in years	7	55.43±8.404	33	51.79±9.303	.346
Weight in kgs	7	94.57±20.911	33	76.03±9.133	0.058
Height in inches	7	65.57±3.735	33	61.45±2.399	.001

Table-II. T-Test Group Statistics

	N		Mean Degree of Flexion (Std. Deviation)
Pair 1	40	Unaffected kneeflexion	128.18±4.945
	40	Affected kneeflexion	83.83±13.095
Pair 2	40	Unaffected kneeflexion	119.13±5.360
	40	Affected kneeflexion	87.93±16.334

Table-III. T-Test Samples statistics

### T-Test

One sample T-test was performed and the mean of knee extension of affected population was 41.40±15.884.

### One-Sample Statistics

N	Mean (Std. Deviation)	Std. Error Mean	
Affected knee extension	40	41.40±15.884	2.511

### One-Sample Test

Test Value = 0

T	df	Sig. (2-tailed)	Mean Difference	
Affected knee extension	16.484	39	.000	41.400

### DISCUSSION

This study was done to predict the effect of knee osteoarthritis on hip flexibility by using modified Thomas test among elders.

	Body Mass Group	N	Mean (Std. Deviation)	P-Value
Age in years	Over Weight	16	55.06±8.629	.139
	Obese	24	50.67±9.249	.134
Weight in kgs	Over Weight	16	68.00±4.290	.000
	Obese	24	86.79±12.532	.000
Height in inches	Over Weight	16	61.38±2.363	.181
	Obese	24	62.71±3.394	.151
Duration of medication (Months)	Over Weight	16	15.50±14.311	.806
	Obese	24	14.50±11.182	.816
Unaffected knee flexion	Over Weight	16	127.06±5.531	.250
	Obese	24	128.92±4.481	.273
Affected knee flexion	Over Weight	16	82.38±14.555	.574
	Obese	24	84.79±12.254	.588
Un affected hip flexion	Over Weight	16	116.75±6.465	.020
	Obese	24	120.71±3.862	.038
Affected hip flexion	Over Weight	16	84.56±16.645	.294
	Obese	24	90.17±16.080	.294
Affected knee extension	Over Weight	16	41.19±19.542	.946
	Obese	24	41.54±13.368	.950

**Table-IV. Group statistics**

The mean age is  $51.79 \pm 9.303$  for female and  $55.43 \pm 8.404$  for male among all of them complaint of pain, difficulty in performing house chores and daily living activities. The patient with these symptoms had degenerative changes in joint and altered normal contour of knee joint and diagnosed knee osteoarthritis.

Among 80% of these patients lacked the importance of physiotherapy exercises in management of knee osteoarthritis with symptom of pain and discomfort and due to these symptom patient prefer to live a sedentary lifestyle and was unable to do normal daily life activities. 20% of patients who were seeking physiotherapy help had active lifestyle and little pain and discomfort.

Modified Thomas Test was used to determine the effect of knee osteoarthritis on hip flexibility among elders. This is an efficient test that can be practically used to assess patient's ability to pursue exercise. In this study, Modified Thomas Test was used and ranges were measured with

help of goniometer to assess the normal range and the actual reduced range of motion of different movements. By predicting the ranges of motion therapist can help in development of safe and effective exercise therapy according to capacity and endurance of patients with osteoarthritis of knee joint.

In previous researches Modified Thomas Test was used to assess the effect of knee osteoarthritis on hip flexibility among different athletes. Some studies have also used modified Thomas test to evaluate the lumbo-pelvic stability in patients of osteoarthritis. There were limited studies on normal elders population with knee osteoarthritis and who face a lot of difficulty in doing daily life functions and even in self-care like toileting, bathing, cooking, walking and climbing stairs.

Planned and structured physical therapy is an important component of disease management for patients with knee osteoarthritis who have pain and severe discomfort and difficulty in daily living activities. Exercise helps to improve gait control and helps in gaining strength, mobility, and accurate balance. Exercise helps the muscle to develop strength and to reduce the load on joints which slows down the degenerative changes in joint and reduces the shear forces on joint. It also helps to improve the neural control of joints that helps in balance, proprioception and gait control.

Using this Modified Thomas Test, physical therapists can make more informed recommendations regarding an exercise regimen that can be tailored for each patient with hopes of maximizing adherence and improving overall disease outcomes.

## CONCLUSION

This study concluded that there is significantly moderate relationship exist between hip flexibility and knee osteoarthritis. The p-value of this correlation is .003 and it shows a moderately weak relationship among variables. It shows us that due to knee osteoarthritis it is not necessary that flexibility of hip joint gets affected at a large rate. It affects slightly the flexibility to be reduced due to decrease in movement and reduced daily

life activities.






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2	M Usman Sarwar	Literature review.	
3	Hafiz Salman Saeed	Data analysis & Collection.	
4	Manqoos-Ur-Rehman	Data analysis.	
5	Imran Manzoor	Discussion, Conclusion.	
6	Naeem Abbas	Research association.	