Original Article

Frequency of knee osteoarthritis and its association with hip abductor muscle strength and difficulty while ascending and descending stairs among osteoarthritis patients

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Objective: To determine frequency of knee osteoarthritis (OA) and its association with hip abductor muscle strength and difficulty during ascending and descending stairs among osteoarthritis patients.

Methodology: This cross sectional study was conducted on 167 female patients presenting with knee OA in different hospitals of Lahore. We used a standard knee osteoarthritis-linked health assessment survey, WOMAC Osteoarthritis Index. Muscular strength of hip abductors was investigated using manual muscle testing grading system. Data were analyzed using SPSS 21.

Results: Mean age of patients was 58.33±8.836 year (range 45-82). We found 91(54.5%) patients had left knee, 63(37.7%) right knee and 13(7.8%) had bilateral knee OA. Positive association was seen between knee OA with difficulty while climbing stairways (p=0.018) and also with strength of hip abductors (p=0.001). However, no significant association existed between OA of knee and difficulty while moving down stairs (p=0.073).

Conclusion: The knee OA was frequent among female patients. There was positive association between knee OA and difficulty while ascending staircase but no significant relation exist between OA of knee and trouble during going down steps. An association between knee OA and strength of hip abductor muscles was found, which showed that in knee OA, hip abductors i.e., gluteus medius were more prone to weakness as compared to others hip muscles in this study. (Rawal Med J 202;46:465-468).

Keywords: Knee osteoarthritis, pain intensity, muscle strength.

INTRODUCTION

A significant number of our elderly population is affected by knee osteoarthritis (OA) causing pain and loss of function. The disease occurs as a result of wear and tear of the cartilage that cushions the joints and causes problems in activities of daily life.[1] A decrease in hip muscle strength was witnessed in people with OA of the knee.[2] In knee OA, patients the first symptom is usually while climbing stairs as hip abductor muscle strength plays a vital role during stair climbing functional movements and there is knee abductor movement (KAM) reduction in such patients.[3,4]

The intensity of pain grows when an individual with high knee adduction movement goes up and down the staircase.[5] A noteworthy relationship was found between knee OA and act of mounting and dismounting steps.[6] Patients with varus knee malalignment are at increased risk for development of OA.[5] With increasing age, cartilage worsening and osteophyte formation occurs in joint.[7] Timely detection may be beneficial in better treatment and may prevent increased structural destruction.[3] Hence strengthening exercises are strongly advised in knee OA.[8] A difference in the character of knee pain during weight bearing is said to be reported when related to non-weight bearing pain.[9] Muscle weakness is the most important physical indication in knee OA.[7]

Suitable muscle strength useful for joint stability and mobility.[10] Weight loss, exercise and patient education in non-drug therapies are also beneficial.[7,11] Management in knee OA is chiefly symptomatic pain relief.[13] Another type of physical activity is exercise therapy which is often scheduled and organized and carried out by occupational and physical therapists.[12,14] Rehabilitation generally comprises of anaerobic and aerobic exercises, management of weights, strengthening of muscles, self-supervision and awareness, biomechanical

management and involvement in activities of daily living.[15,16]

METHODOLOGY

This observational cross-sectional study was conducted from January to June in 2019 and using non-probability convenient sampling patients were recruited from different hospitals of Lahore. Ethical approval was taken from IRB committee of University of Lahore (letter # IRB-UOL-FAHS/509/2019). Consent was taken from all patients. Sample size was calculated by this formula, . $= z^2_{1-\partial/s} P(1-P)/d^2$.

Females with age of 45 to 60 years having diagnosed unilateral or bilateral knee OA of any grade using Kellgren and Lawrence system for classification, assessed by anterior-posterior radiographs were included in study. Those with history of knee surgery or fracture, and history of fall and any other injury or pathology such as rheumatoid arthritis, bone tuberculosis and malignancy were excluded. Demographic data such as age and gender of patients was collected.

WOMAC osteoarthritis index questionnaire was used to assess difficulty while ascending and descending stairs in these subjects. Visual analogue scale (VAS) was used to evaluate intensity of pain and manual muscle testing grading system was used by therapist manually to assess strength of hip abductors.

Statistical Analysis: All data analysis was performed using SPSS version 21. For quantitative variables, mean and standard deviation were calculated. For qualitative variables, frequency and percentage were calculated. Chi-square test was used after checking normality of data by Kolmogorov Smirnov test. Association was found between different variables. $p<0.05$ was considered significant.

RESULTS

The study included 167 females with age range from 45 to 82 years (mean 58.33±8.836). Out of 167 subjects, 91(54.5%) females had left knee OA, 63(37.7%) had right knee OA and 13(7.8%) had bilateral knee affected. On VAS patients showed that 15.6% had mild pain, 35.3% had moderate pain, 25.7% had severe pain, 20.4% had very severe pain and 3.0% had worst pain. Patients had difficulty while ascending stairs using WOMAC Osteoarthritis Index with 32.9% had extreme difficulty, 31.1% had severe difficulty, 29.9% moderate difficulty and 6.0% had mild difficulty while ascending stairs. Positive association was found between knee OA with difficulty while climbing stairways (p=0.018) and also with strength of hip abductors (p=0.000). However, no significant association existed between OA of knee and difficulty while moving down stairs (p=0.073).

Table 1. Association between Knee OA and hip muscle strength.

		Manual Muscle Testing					Total	Chi-Square	P value
		Grade 5	**Grade 4**	**Grade 3**	**Grade 2**	**Grade 1**			
OA	**Left Knee**)%(	13 76.5%	31 56.4%	30 60.0%	17 38.6%	0 0.0%	91 54.5%	25.553[a]	.001
	Right Knee)%(	4 23.5%	23 41.8%	16 32.0%	20 45.5%	0 0.0%	63 37.7%		
	Bilateral)%(	0 0.0%	1 1.8%	4 8.0%	7 15.9%	1 100%	13 7.8%		
Total Percentage		17 100.0%	55 100.0%	50 100.0%	44 100.0%	1 100.0%	167 100.0%		

Table 2. Association between Knee OA and difficulty while ascending stairs.

		Difficulty while ascending stairs				Total	Chi Square	P value
		Mild	Moderate	Severe	Extreme			
OA	**Left Knee**	7	32	27	25	91	15.252[a]	.018
	Percentage	70.0%	64.0%	51.9%	45.5%	54.5%		
	Right Knee	3	18	22	20	63		
	Percentage	30.0%	36.0%	42.3%	36.4%	37.7%		
	Bilateral	0	0	3	10	13		
	Percentage	0.0%	0.0%	5.8%	18.2%	7.8%		
Total		10	50	52	55	167		
Percentage		100.0%	100.0%	100.0%	100.0%	100.0%		

Table 3. Association between knee OA and difficulty with descending stairs.

		Difficulty while descending stairs				Total	Chi-Square	P value
		None	Mild	Moderate	Severe			
OA	**Left Knee**	55	20	11	5	91	11.539[a]	.073
	Percentage	61.1%	50.0%	39.3%	55.6%	54.5%		
	Right Knee	32	17	12	2	63		
	Percentage	35.6%	42.5%	42.9%	22.2%	37.7%		
	Bilateral	3	3	5	2	13		
	Percentage	3.3%	7.5%	17.9%	22.2%	7.8%		
Total		90	40	28	9	167		
Percentage		100.0%	100.0%	100.0%	100.0%	100.0%		

There was positive association between Knee OA and hip muscle strength ($p \leq 0.001$), which means that in knee OA, hip abductors are weakened causing difficulty in movements and stair climbing (Table 1). There was positive association between Knee OA and difficulty while ascending stairs ($p=0.018$), showing that patients with knee OA have difficulty in ascending stairs (Table 2). Association between Knee OA and difficulty while descending stairs showed no significant association ($p=0.073$) (Table 3).

DISCUSSION

In contrast to this study, a study from Japan which included of 157 participants concluded that knee OA patients had increased knee pain while getting down the staircase as compared to climbing (β, − 0.11; 95% CI, − 0.22 to −0.0002).[6] The same study also showed that after the adjustment for age, gender, and knee extension muscle strength, those with knee pain when descending stairs showed significantly decreased hip abductor muscle strength (β, − 0.09; 95% CI, − 0.19 to−0.003).[6]

Similarly, a case-control study was carried out with case group of 89 participants and control group of 23 participants who worked on patients that were experiencing indicative medial knee OA and patients that were not experiencing the indications. They concluded that in people with OA of knee significant strength deficits were evident for all hip muscle groups evaluated ($p<0.05$). All the muscles of the hip which includes hip abductors, adductors, flexors, extensors or rotators were observed to be 20%-40% weaker in those suffering OA of knee.[1]

Another cross-sectional study conducted in 2016 enrolled 270 patients with medial knee OA, aimed to study whether knee pain during different activities of daily living (ADLs) is related with physical activity in patients with early and severe knee OA. It concluded that knee pain while

ascending stairs and while walking on a flat surface or bending to the floor or standing up was a possible limiting factor for physical activity in early and severe knee OA, respectively. In the early group of knee OA, the physical activity decreased as the knee pain increased (regression coefficient = −1033.70, p =0.018). In the severe group of knee OA, the more knee pain they experienced while walking on a flat surface, the lower their physical activity was (coefficients = −1850.87, p=0.026; coefficients = −2640.35, p=0.010).[4]

CONCLUSION

An association exists between knee OA and strength of hip abductor muscles which showed that in knee OA, hip abductors i.e., gluteus medius was more prone to weakness as compared to others hip muscles in this study.

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