

Association between Knee Osteoarthritis and Excessive Climbing Stairs

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Author of this article fulfilled ALL 04 Criteria of Authorship:

1. Conception and design of or acquisition of data or analysis and interpretation of data.
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ABSTRACT

Objectives: To evaluate the association between excessive stairs use and severity of osteoarthritis in Pakistani population.

Methods: A Observational Cross sectional study was conducted at the orthopaedics department, Jinnah Postgraduate Medical Centre, Karachi, Pakistan between May 2019 to September 2019 for a duration of five months. All patients who did not give consent, were younger than 18 years, had hormone replacement therapy, were diagnosed with hyperparathyroidism, aemochromatosis, or any other rheumatological disease, or had a history of major trauma or surgery or infection around the knee joint were excluded from the study. All data was analyzed using the statistical package for social sciences (SPSS version 26).

Results: A total of 102 patients were enrolled in the study. The mean age of patients was 53.39 ± 3.96 years. Out of 102 patients 70.6% were male while 29.4% were female. The majority belonged to the group between the ages of 50 and 55 years. The mean body mass index was 28.67 ± 7.73 kg/m². The majority of the patients with knee osteoarthritis belonged to unskilled group. The study found a significant relationship between excessive use of stairs and severity of osteoarthritis ($p < 0.001$). The study shows that the greater the duration and number of stairs climbed, the more severe the osteoarthritis.

Conclusion: The current study findings indicate that there is a significant relationship between excessive use of stairs and severity of osteoarthritis. Further large scale, longitudinal studies should be conducted to explore the risk factors associated with knee osteoarthritis and patient outcomes.

Keywords: Osteoarthritis, knee joint, rheumatology, rheumatoid arthritis, elderly, aging population

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INTRODUCTION

Knee joint osteoarthritis is known as one of the commonest problems of patients presenting in the elderly population. It is the fourth leading cause of disability, worldwide.¹ Patients with knee joint osteoarthritis suffer from limited physical activity, severe pain, and subsequent low quality of life.²

In India and Bangladesh the reported prevalence of knee osteoarthritis is 5.78% and 10.20%, respectively.^{3,4} A study in Pakistan has shown that 28% of the urban and 25% of the rural population have knee osteoarthritis (KOA)⁵. In a Karachi based study, the author reported that affluent patients were more frequently diagnosed

with KOA as compared to patients belonging to a low socioeconomic status (6.6% versus 5%).⁶

Osteoarthritis of the knee is a major contributor of pain and directly affects the routine activities of the patient.⁷ Furthermore, the treatment and management is not only versatile but also very costly. Patients often require physiotherapy in addition to the pharmacotherapy. The use of analgesics for a long time leads to its iatrogenic effects.⁷⁻⁸

A wide number of factors are labeled for initiating or promoting in development of osteoarthritis. Yet there is no exact etiology is identified as the main cause. Still somehow it is labelled as Iatrogenic or the ageing process. Lifestyle

is one of the commonest factors. The lifestyle varies widely in different parts of the world. In our urban areas there is mushroom growth of flats without proper elevator facilities owing to the increasing urbanization.⁹ The movement through stairs to multiple floors is many times a day. This leads to an increase in workload on knee joints. It creates a high impact on both tibiofemoral and patellofemoral joints.¹⁰

The search for associated factors initiating or promoting is continued. Stairs movement is an extraordinary change in urban life style. Even though a significant number of studies have been done on the subject in different countries, however, there is only limited data available from local settings. The current study aimed to evaluate the association between excessive stairs use and severity of osteoarthritis in Pakistani population. The results of this study are expected to provide a foreground for future studies to be conducted on developing preventive strategies and ultimately reducing the morbidities and mortalities associated with knee osteoarthritis.

METHODOLOGY

A prospective observational study was conducted at the orthopaedics department, Jinnah Postgraduate Medical Centre, Karachi, Pakistan between May 2019 to September 2019 for a duration of five months. A non probability consecutive sampling technique was used to enroll participants in the study. All patients between the ages of 40 and 65 years with or without family history of knee osteoarthritis, diagnosed with knee osteoarthritis in any grade were included in the study. All patients who did not give consent, were younger than 18 years, had hormone replacement therapy, were diagnosed with hyperparathyroidism, haemochromatosis, or any other rheumatological disease, or had a history of major trauma or surgery or infection around the knee joint were excluded from the study.

For the diagnosis of clinical osteoarthritis, patients were to have pain during limb movement, tenderness, morning stiffness, loss of flexibility as indicated by limited range of motion, grating sensation which was defined as a grinding or scraping sensation in the joint during limb movement. Xray of the joint showed bone spurs which were defined as the extra bits of bone around the joint due to destruction.

The patients were then classified according to the Oxford Knee Score (OKS) into mild, moderate, and severe osteoarthritis. For all patients, cumulative

stair steps were determined which was defined as the approximate calculation of total movements through stair before the start of symptoms of knee osteoarthritis. Patients were stratified according to the number of stairs climbed. Grade I included all patients who climbed less than 200 thousands steps on stairs, grade II consisted of patients who climbed between 200 to 300 thousands steps on stairs, while patients who climbed more than 300 thousand steps on stairs belonged to grade III.

All data was analyzed using the statistical package for social sciences (SPSS version 26). Age, gender, occupation, and classes of osteoarthritis were presented as frequency and percentage while continuous data were presented as mean and standard deviation. Association between severity of osteoarthritis and excessive climbing stairs was determined using one way Anova. A p-value of < 0.05 was considered as significant.

RESULTS

A total of 102 patients were enrolled in the study. Male were in the majority. The mean age of patients was 53.39 ± 3.96 years. The majority belonged to the group between the ages of 50 and 55 years. The mean body mass index was 28.67 ± 7.73 kg/m². The majority of the patients with knee osteoarthritis belonged to unskilled groups (see table 1).

Table 1: Demographic and Clinical characteristics of Study Population

Gender	
Male	72 (70.6%)
Female	30 (29.4%)
Age (years)	53.39 ± 3.96
<50	24 (23.5%)
>54	29 (28.4%)
50-55	49 (48%)
BMI (kg/m²)	28.67 ± 7.73
Occupation	
Highly Skilled	8 (7.8%)
Skilled, Manual	13 (12.7%)
Skilled, Non Manual	14 (13.7%)
Unskilled	67 (65.7%)

Table 2: Association between Severity of Osteoarthritis and Number of Stairs Climbed

Osteoarthritis	Stairs (mean ± SD)	p value
Early	245091 ± 92000	0.001
Moderate	263161 ± 61435	
Severe	325675 ± 100535	

The study found a significant relationship between excessive use of stairs and severity of osteoarthritis (p<0.001) (See table 2).

Mean duration of climbing stairs (years) and mean number of stairs climbed per day in different classes of Osteoarthritis

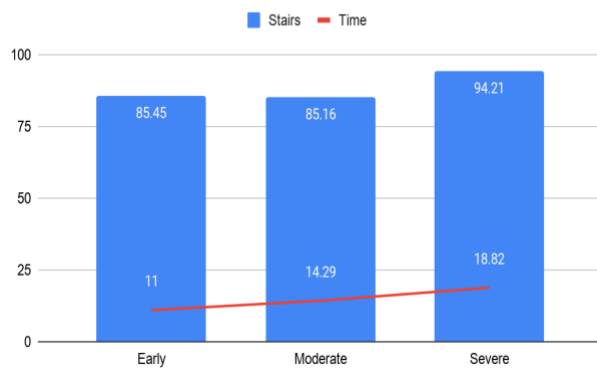


Figure 1: Mean duration of climbing stairs (years) and mean number of stairs climbed per day in different classes of Osteoarthritis

Figure 1 depicts the relationship between the mean duration of climbing stairs (in years) and the mean number of stairs climbed per day in different classes of knee osteoarthritis. The study shows that the greater the duration and number of stairs climbed, the more severe the osteoarthritis.

DISCUSSION

We can interpret from our study that there is association between the duration and number of stairs climbed with severity of osteoarthritis of knee. Osteoarthritis most commonly shows symptoms after the age of 50¹¹. The results of our study indicated that most patients suffering from osteoarthritis belonged to the age group of 50-55. This implies that significant radiographic signs such as joint space narrowing and osteophytic changes are seen in this particular age group.

Studies have shown that osteoarthritis is strongly associated with prolonged kneeling and squatting, both of which involves the use of

quadriceps muscles¹². Weakened quadriceps muscles are an important risk factor in the development of osteoarthritis, especially in women¹³. A study showed that quadriceps muscles were 20% weaker among women with radiographic signs of osteoarthritis, and preceded onset of disease¹⁴. Weakened quadriceps make the knee joint less stable during activities such as stair climbing, thereby increasing the risk of joint pain and deformity.

A study by Hicks et al indicated that patients suffering from knee osteoarthritis had significant defects in their lower extremity joint kinematics when either moving up or down the stairs. Additionally, it was found that subjects with knee osteoarthritis had a greater hip abduction and flexion angles but smaller knee flexion angles¹⁵. These alterations have important clinical implications with respect to the development of treatment strategies to manage these changes.

Another study by Goncalves et al also indicated that mild osteoarthritis is associated with kinematic changes of the hip in the frontal plane and kinematic alterations of the ankle in the sagittal plane¹⁶.

These changes implies that modifications of the kinematics of the knee joint may increase the risk of developing knee osteoarthritis, particularly in adults¹⁷.

A study by Jensen reported a positive relationship between knee osteoarthritis and stair climbing. The findings of the study were consistent with our results, and concluded that there was an increased risk for the development of knee osteoarthritis in patients who climbed stairs¹⁸.

There is need to carry out a study with a larger sample size to establish Stairs Climbing as a promoting factor and it will guide patients to a change in life style.

Our study had several potential limitations. The sample size was small, which limits the generalization of findings if applied to a larger population. Further study should be conducted with a large number of patients of knee osteoarthritis, which would help clarify the potential factors related to the inability to either ascend or descend stairs.

CONCLUSION

The current study findings indicate that there is a strong relationship between excessive use of stairs and severity or worsening of osteoarthritis in patients. Further large scale, longitudinal studies should be conducted to explore the risk factors associated with knee osteoarthritis and patient outcomes.

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REFERENCES

1. Fransen M, Bridgett L, March L, Hoy D, Pensegera E, Brooks P. The epidemiology of osteoarthritis in Asia. *International journal of rheumatic diseases*. 2011 May;14(2):113-21.
2. Iqbal MN, Haidri FR, Motiani B, Mannan A. Frequency of factors associated with knee osteoarthritis. *JPMA-Journal of the Pakistan Medical Association*. 2011 Aug 1;61(8):786.
3. Chopra A, Patil J, Billampelly V, Ralwani J, Tandale HS. The Bhigwan (India) COPCORD: methodology and first information report. *APLAR J Rheumatol* 1997; 1: 145-51.
4. 2. Haq SA, Darmawan J, Islam MN, UddIn MZ, Das BB, Rahman F, et al. Prevalence of rheumatic diseases and associated outcomes in rural and urban communities in Bangladesh: a COPCORD study. *J Rheumatol* 2005; 32: 348-53.
5. Farooqi A, Gibson T. Prevalence of the major rheumatic disorders in the adult population of north Pakistan. *Br J Rheumatol* 1998; 37: 491-5.
6. T. GIBSON, K. HAMEED, M. KADIR, S. SULTANA, Z. FATEMA and A. SYED. Knee pain amongst the poor and affluent in Pakistan. *British Journal of Rheumatology* 1996;35:146-149
7. Liaqat M, Liaqar B, Rauf R, Bashir F. Prevalence of knee osteoarthritis and quality of life in middle aged adults. *International Journal of Rehabilitation Sciences (IJRS)*. 2018 Dec 30;7(02):26-8.
8. Rana IA, Bhatti SS. Lahore, Pakistan—Urbanization challenges and opportunities. *Cities*. 2018 Feb 1;72:348-55.
9. Rana IA, Bhatti SS. Lahore, Pakistan—Urbanization challenges and opportunities. *Cities*. 2018 Feb 1;72:348-55.
10. Guo M, Axe MJ, Manal K. The influence of foot progression angle on the knee adduction moment during walking and stair climbing in pain free individuals with knee osteoarthritis. *Gait & posture*. 2007 Sep 1;26(3):436-41.
11. Loeser RF. Aging processes and the development of osteoarthritis. *Current opinion in rheumatology*. 2013 Jan;25(1):108.
12. Coggon D, Croft P, Kellingray S, Barrett D, McLaren M, Cooper C. Occupational physical activities and osteoarthritis of the knee. *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology*. 2000 Jul;43(7):1443-9.
13. Hunter DJ, Eckstein F. Exercise and osteoarthritis. *Journal of anatomy*. 2009 Feb;214(2):197-207.
14. Fragala MS, Cadore EL, Dorgo S, Izquierdo M, Kraemer WJ, Peterson MD, Ryan ED. Resistance training for older adults: position statement from the national strength and conditioning association. *The Journal of Strength & Conditioning Research*. 2019 Aug 1;33(8).
15. Hicks-Little CA, Peindl RD, Hubbard TJ, Scannell BP, Springer BD, Odum SM, Fehring TK, Cordova ML. Lower extremity joint kinematics during stair climbing in knee osteoarthritis. *Medicine & Science in Sports & Exercise*. 2011 Mar 1;43(3):516-24.
16. Gonçalves GH, Selistre LF, Petrella M, Mattiello SM. Kinematic alterations of the lower limbs and pelvis during an ascending stairs task are associated with the degree of knee osteoarthritis severity. *The Knee*. 2017 Mar 1;24(2):295-304.
17. Karamanidis K, Arampatzis A. Evidence of mechanical load redistribution at the knee joint in the elderly when ascending stairs and ramps. *Annals of biomedical engineering*. 2009 Mar 1;37(3):467-76.
18. Jensen LK. Knee osteoarthritis: influence of work involving heavy lifting, kneeling, climbing stairs or ladders, or kneeling/squatting combined with heavy lifting. *Occupational and environmental medicine*. 2008 Feb 1;65(2):72-89.