Original Article

Potential Risk Factors and Physical Functioning of Women with Knee Osteoarthritis

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Abstract

Background: Knee osteoarthritis is a common musculoskeletal condition that has a severe effect on physical functioning, especially in women that are above the age of 40, causing chronic pain, stiffness in the joints, loss of mobility, which worsens overall quality of life, resulting in many individuals being incapable of performing normal daily tasks, among other ways and increased dependency.

Objectives: The study aims to identify frequency and possible risk factors of Knee osteoarthritis and Physical Functioning of women aged 40 years and over.

Methods: The study is a cross-sectional analytical study that was carried out at the University of Lahore Teaching Hospital on 350 women aged 40 years and above using non-probability convenience sampling. A structured questionnaire was used to gather data through the collection of demographic data, risk factors, and Western Ontario and McMaster Universities osteoarthritis index (WOMAC-34) to measure physical functioning. The research time was between August 2024 and January 2025. The statistical analysis was conducted in SPSS Version 25.0 with the help of chi square to access the association of different risk factors and t-tests to determine the physical functioning of the two groups. The p-value of less than 0.05 was deemed to be significant.

Results: The findings revealed that knee osteoarthritis was diagnosed in 30.3 percent of the study participants with significant correlations between knee osteoarthritis and age greater than 40 years (p=0.015), hand osteoarthritis (p=0.033), and estrogen deficiency (p=0.004), BMI, and strenuousness of work (p=0.001). Knee OA women had a higher score on WOMAC which indicated more pain, stiffness and less physical functionality. Also, a high value (p=0.001) was found between knee OA and the physical activity levels, where the low level of physical activity was associated with the high prevalence of OA.

Conclusion: The study identifies increased age and modifiable risk factors like high BMI, estrogen deficiency, hand osteoarthritis, and physically demanding work as significant risk factors for knee OA in women. An increased physical activity to enhance functional outcome in knee oa women can be achieved by promoting regular and joint-friendly physical activity that has the potential to considerably better pain, stiffness, and overall physical functioning in affected women.

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Introduction

Osteoarthritis (OA), commonly referred to as degenerative joint disease or age-related arthritis, is one of the leading causes of disability worldwide that greatly affects the ability of individuals to perform physical

activities. In the context of public health, the term arthritis encompasses more than 100 rheumatic diseases and conditions that affect the joints, tissues that surround, and other structures made up of connective tissue.[1] One of the most common types is osteoarthritis, which is more common in older adults and attacks the knee joint mainly in the developed nations. Many people suffering from osteoarthritis change their daily lives to deal with disability in mobility and pain caused by the disease.[2]

The causes of osteoarthritis are many and it can occur at any age. Premature osteoarthritis may develop in young athletes due to injury to the knee joint, obesity and genetic history. History of trauma 3.86 times.[3] Knee OA risk is increased among major injuries, obesity, and is frequently a component of an overall disposition to osteoarthritis. High frequency knee stressors, like physically demanding employment, involving heavy lifting or repeated bending, can add to the risk of developing the condition. In addition, muscle weakness plays a role in joint instability and functional limitations in people with knee OA.[4]

Knee osteoarthritis involves all three knee-joint compartments the medial, lateral, and patellofemoral joints, and the process is usually progressive, restricting daily activity over a period of 10 to 15 years. It used to be considered to be solely caused by aging and gradual wearing down of cartilage; without any connection to inflammation.[5]

Osteoarthritis is characterized by the damage to the articular cartilage, the formation of bony growths called osteophytes and hardening of the bone beneath the cartilage, sclerosis. Later in life, fluid-filled cysts can occur in the affected bone as well. It is also affected by a number of factors including genetics, aging, obesity, diabetes, joint inflammation, and your body's own natural immune response.[6] Issues with leg alignment as abnormal joint shape, previous injuries, and inflammation related to metabolic conditions also play important role.

Knee taping, which is done with the intention to realign the patella and offload soft tissues, can alleviate pain. The application of knee braces in individuals with knee OA should also be supported. The condition is prevalent in older adults but may be a result of lifestyle and past injuries. Due to hormonal and structural differences, women are at greater risk, particularly after menopause. Early diagnosis and lifestyle changes can help delay its progression and require a better daily functioning.[7]

It is important to understand the risk factors of knee osteoarthritis (OA) among women to be able to detect this disease at an early stage. The course of knee OA in women may be affected by a number of important factors, such as hormonal changes (especially during menopause), muscle weakness, and decreased physical activity, which can lead to greater instability of the joint, pain, and limitations to function. Additionally, nutritional deficiencies, such as low levels of vitamin D and calcium, may have a negative effect on bone and cartilage health, further worsening the condition.[8]

The research focuses on issues like modifiable risk factors, including BMI, physical activity levels and hormonal imbalances are either significantly related to the onset and progression of knee OA, and addressing these risk factors can improve mobility and quality of life in affected women. Identifying these factors will help to inform preventative strategies and interventions directed at maintaining mobility and improving quality of life in women with knee OA.

Methods

This was an Analytical cross-sectional study, that was conducted at the Orthopedic Department of The University of Lahore Teaching hospital, Lahore- over a period of six months starting from August 2024 to January 2025.

Physical functioning compromised among 35%,[9] KO women yield 350 sample size using openepi tool. Women were recruited using non-probability convenience sampling. Inclusion criteria include women aged >40 years, married, and not using assistive devices. Exclusion criteria include a history of total knee arthroplasty or corrective knee surgery, neurological disorders affecting lower extremity function, inflammatory rheumatic diseases, or any condition impairing physical function and ability to complete testing.

Data Collection Procedure included following ethical approval, participants were recruited from The University of Lahore Teaching hospital. Diagnostic procedures were followed established clinical guidelines for identifying patients with KO. Questionnaire containing sociodemographic, potential risk factors and questions assessing physical inactivity and health status was distributed. Upon consent, eligible participants were complete self-reported measures and performance-based tests. The Western Ontario and McMaster Universities OA Index (WOMAC-34) assessed physical functioning. Informed consent was taken from the individuals participating in the study.

Data was collected after ethical permission from Uni-

versity Institute of Public Health vide letter no UIPH/UOL/722/2024. Afterwards, through structured demographic forms, risk factor assessments, and standardized performance-based tests.

Data was analyzed using SPSS version 25.0 with continuous variables summarized as means and standard deviations. Whereas, categorical variables were presented as frequencies and percentages. Pearson's chi-square test was applied for categorical variables and t-test to access the physical functioning among two groups, P-value ≤0.05 was statistically significant.

Results

Out of the total 350 participants, 106 individuals (30.3%) were diagnosed with knee osteoarthritis, while the remaining 244 participants (69.7%) were not diagnosed with KO. Out of which, following risk factors were assessed along with association in Table 1.

Table 1: *Potential Risk Factors association with Knee osteoarthritis*

		Knee osteoarthritis		Total	P-value
		Yes	No		
Hand OA	Yes	54	154	208	
	No	52	90	142	0.033*
Total		106	244	350	
Uric Acid	Raised	52	117	169	
	Normal	54	127	181	0.493
Total		106	244	350	
Smoking	Smoker	1	0	1	
	Non-Smoker	105	244	349	0.129
Total		106	244		
Increasing Age (40+)	Yes	61	106	167	
	No	45	138	183	0.015*
Total		106	244	350	
Occupational Risk	Yes	50	94	144	
	No	56	150	206	0.082
Total		106	244	350	
Co-morbiditie (IHD)	Yes	98	231	329	
	No	8	13	21	0.465
Total		106	244	350	
Estrogen effected	Yes	51	157	208	
	No	55	87	142	0.004*
Total		106	244	350	
BMI	Underweight	20	57	77	
	Normal	43	126	169	
	Overweight	41	61	102	0.008*
	Obese	2	0	2	
Total		106	206	350	
Physical strenuous of work	Mildest	104	18	122	
	Mild	2	132	134	
	Moderate	0	36	36	
	Heavy	0	39	39	0.001*
	Heaviest	0	19	19	
Total		106	206	350	

The WOMAC scale categorizes the physical functioning into three groups. Among 350 participants, 55 individuals (15.7%) were classified in Group I that indicate little physical function. Group II showed irregular physical function among 134 participants (38.3%). Whereas, 161 participants (46.0%), fell into Group III that signified regular physical function. These findings highlight variations in physical functioning levels among women with knee osteoarthritis that emphasized needs to improve mobility and quality of life to reduce KO burden.

Table 2: *Relationship between Physical activities and Knee osteoarthritis*

Categories		Knee OA (Present)	Knee OA (Absent)	Total	P-value
Physical activity	Group I	24 (6.8%)	31 (8.85%)	55 (15.71%)	0.001*
	Group II	49 (14%)	85 (24.28%)	134 (38.29%)	
	Group III	33 (9.42%)	128 (36.57%)	161 (46%)	
Total		106 (30.30%)	244 (69.70%)	350 (100%)	

**Moreover, according to Western Ontario and McMaster osteoarthritis index (WOMAC), the total of 96 score for pain, stiffness, and difficulty in daily activities were obtained. Score of 72 and above indicates little physical functioning. The score of 25 to 71 indicates irregular physical functioning and 25 and below indicated regular physical function.

Table 3: *Relationship between WOMAC domains score and Knee osteoarthritis*

Domains of WOMAC	KO (Present)	KO (Absent)	Mean difference	t-test (p-value)
Pain	15±1.53	5.04±3.74	9.96	0.021*
Stiffness	5.1±1.01	2.04±0.82	3.06	0.018*
Physical function	39.9±4.98	16.27±7.19	23.63	<0.001*
TOTAL SCORE	60.1±7.33	23.37±11.40	36.73	<0.001*

The results show that there are significant differences between the KO+ and KO- groups in terms of pain ($p = 0.021$) and stiffness ($p = 0.018$), with KO group experiencing more severe symptoms. Additionally, both physical function ($p < 0.001$) and WOMAC total score ($p < 0.001$) were significantly worse in the absent KO

group, indicating that knee osteoarthritis significantly impacts overall physical function and quality of life.

Discussion

The study identifies significant role of modifiable risk factors like Body Mass Index (BMI),age along with physical activity, occupational strain, estrogen deficiency with the occurrence of knee osteoarthritis (OA) in females. The authors have also the important effect of knee OA on the physical functioning of women where the participants indicated that their pain had increased, joint stiffness and daily activity limitation were experienced and these factors were measured using the WOMAC scale. These findings are clear that knee OA in women is a complex condition, whose determinants comprise multifactorial issues such as biological and lifestyle determinants, which directly influence the physical functioning of the people with such conditions.

This research revealed that there were several important risk factors that impacted on knee osteoarthritis (OA) and the effect on the physical functioning of women as well. These results are in line with another study that was done by Wen et al., which reported that decreased grip strength is correlated with more prevalence of both hand and knee OA highlighting the interrelatedness of joint degeneration in both upper and lower extremities.[10] Similarly, another study of 2018 demonstrated higher prevalence of both hand and knee OA in endemic regions, which tells the significance of regional and environmental factors in OA development.[11]

There is inflammatory joint degradation that is thoroughly explained which emphasized the overlapping pathophysiology of OA with other inflammatory arthritis, which supports the other risk factors observed in our population.[12] Findings of this study show uric acid's role align with another study who proposed serum uric acid as a useful biomarker for knee OA severity, complementing diagnostic assessments.[13] Another study showed association between serum uric acid levels and clinical and radiological severity of knee OA, telling significant potential as a risk factor beyond gout.[14]

While in another showed that smoking increases cartilage loss in knee OA, that increase influence of tobacco on further exploration, as indicated by recent findings on exercise recovery in smokers.[15] The impact of obesity on OA demonstrated that weight adjusted waist index is significantly linked with OA, which corresponds well with our observed BMI associations.[16]

In addition, another study concerning OA comorbidities, endocrine and metabolic factors, in favor of the incorporation of estrogen deficiency as the key risk factor of OA.[17] This is also emphasized in another significant study which points to the fact that estrogen changes increase OA pain in perimenopause and that their effect is hormonal in nature in our female cohort.[18]

Mei et al. reviewed the role of hormone replacement therapy in OA and cardiovascular outcomes, suggesting therapeutic considerations that may benefit affected in the women.[19]

Occupational strains are also contributors in this study that aligns with the systematic review which linked occupations with high physical activity with higher OA risk, especially in weight-bearing joints.[20] Chen et al. discussed the cost effectiveness of total knee replacement in patients with higher BMI, determining the healthcare burden of obesity-related OA.[21] The pathological basis of knee joint abnormalities was detailed that highlighted cartilage degradation as central to OA progression, physical function limitations was observed.[22]

Eaton et al. documented the high prevalence and progression of hand OA, strengthening our evidence of hand OA as a significant associated risk factor for knee OA.[23] Gender specific risk modeling in 2022 emphasized differential risk factors or profiles between males and females, highlighting the importance of policy making for women as demonstrated. The occupational physical activity link was further supported by a study, who found greater work-related physical activity increased knee OA, mirroring our results on physically strenuous work.[24] The risk factor in knee OA in middle-aged and older adults validated the essential role of age, BMI, and the level of physical activity, the same way this study,[25] Nguyen et al., in their turn, investigated the estrogen effect in OA sex differences, hormonal impact, which is crucial to understanding the OA pathogenesis in women. Thus, the use of interventions targeting the management and modifiable risk factors and hormone-related ones can enhance the functional outcomes and the quality of life of affected women.

Thus, this research paper is valuable in offering insights on the risk factors of KO that can be modified in women as well as the evaluation of physical functioning via the WOMAC scale and its influence on the daily activities. The dependence on self-reported measures can result in a recall or reporting bias which can be a limitation. In addition, future study should be multicenter to study more risk factors which can be modifiable.

The results indicate that interventions that focus on modifiable risk factors, including BMI, physical activity, and estrogen deficiency, would contribute to the reduc-

tion of the burden of knee OA in women. Interventions focusing on weight management and physical activity could improve physical functioning and reduce pain and stiffness.

Ethical Approval: The Research Ethics Committee, University Institute of Public Health, The University of Lahore approved this study vide letter No. UIPH/UOL/722/2024.

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Authors' Contribution

SM: Acquisition of data, drafting of article, final approval of the version to be published

BH: Acquisition of data, conception & design, drafting of article

AG: Conception & design, critical revision for important intellectual content

RIS: Analysis & interpretation of data

IHK: Drafting of article, Analysis & interpretation of data, critical revision for important intellectual content, final approval of the version to be published

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