

Association between Fear of Falling and Balance in Elderly with Knee Osteoarthritis

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ABSTRACT

Background: Knee osteoarthritis (KOA) is a prevalent musculoskeletal disorder among older adults that often leads to impaired balance and an increased risk of falls. Fear of falling (FOF) is a common psychological concern within this population, further limiting mobility and diminishing quality of life. This study aimed to examine the association between FOF and balance among elderly individuals with KOA, emphasizing how these factors influence fall risk. **Methods:** A cross-sectional study was conducted involving 43 older adults diagnosed with KOA. FOF was assessed using the Modified Falls Efficacy Scale (MFES), while balance and fall risk were evaluated using the Timed Up and Go Test (TUG). Descriptive statistics were applied to summarize demographic data using counts and percentages for categorical variables. The Chi-Square test was employed to assess the association between FOF and fall risk. **Results:** The findings revealed that 88.3% of participants did not experience significant FOF, while 11.6% reported fear. Regarding fall risk, 65% were categorized as having normal risk, 21% were at risk, and 14% had a high risk. A significant association was observed between FOF and fall risk, $\chi^2(2, N = 43) = 21.37, p < 0.001$, indicating that higher fear levels were linked to impaired balance and significant fall risk. **Conclusion:** The findings suggest that greater FOF is associated with poorer balance and an increased risk of falls among older adults with KOA that may adversely impact daily activities and functional mobility among elderly individuals with KOA. The observed association between FOF and balance impairment highlights the need for targeted rehabilitation strategies aimed at improving confidence, stability, and fall prevention in this population.

Keywords:

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INTRODUCTION

Knee osteoarthritis (KOA) is the most prevalent musculoskeletal disease globally (Langworthy & Dasa, 2024), with an estimated prevalence of 374.7 million and 30.8 million incident cases reported in 2021, and the numbers are projected to rise further by 2045 (Ouyang & Dai, 2025). In Malaysia, the Malaysian Community Oriented Programme for the Control of Rheumatic Diseases (COPCORD) study reported that 64.8% of joint complaints involved the knee, with over half showing clinical symptoms of osteoarthritis (OA) (Veerapen et al., 2007).

The alarming increase in KOA prevalence is primarily attributed to population growth and aging demographics (Langworthy & Dasa, 2024; Yeap et al., 2021). Aging is the strongest risk factor, with individuals aged 55–64, 65–74, and ≥75 years showing 2.91-, 2.78-, and 3.44-fold higher risks of KOA, respectively, compared to those under 55 years (Ji et al., 2023). In fact, the prevalence of KOA among the elderly ranges from 22% to 47% globally (Daniel et al.,

2025; Hawker & King, 2022; Postler et al., 2018), while the Malaysian Elders Longitudinal Research (MELoR) study reported that 27% of older adults experience KOA symptoms (Yeap et al., 2021).

In the context of elderly people, falls are a major public health concern, with prevalence in Malaysia ranging from 4% to 74% (Shaharudin et al., 2020). Falls lead to serious physical, psychological, and economic consequences, including injuries, reduced quality of life, and higher healthcare costs. Previous studies have identified that OA is a key contributing factor to fall incidence among the elderly (Salari et al., 2022; Zhang et al., 2023). Impairments related to KOA such as impaired balance responses, are associated with an increased risk of falls, the leading cause of hospitalization among older adults, often resulting in fractures, soft-tissue injuries, loss of independence, and morbidity (Liu et al., 2017; Zhang et al., 2023). Given this heightened vulnerability, assessing balance impairment in individuals with KOA is crucial.

Additionally, psychological factors, particularly fear of

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falling (FOF) arising from a history of previous falls, may further exacerbate fall risk among older adults (Leong Joyce et al., 2020; Yeong et al., 2016). The coexistence of KOA-related functional limitations and FOF may further compound fall susceptibility (Huang et al., 2025; Zhang et al., 2023). However, local studies evaluating these variables remain limited.

To date, the MELoR study has pioneered this topic by investigating the interplay between knee pain, FOF, and fall incidence. In their prospective analysis of community-dwelling older adults, knee pain at baseline was significantly associated with a 1.76-fold increased risk of developing FOF at a 12-month follow-up (Mat et al., 2020). Building upon this established framework, this study aimed to examine the association between FOF and balance among elderly individuals with KOA, emphasizing how these factors can influence fall risk. Elucidating this specific relationship is vital for expanding current clinical knowledge, as it highlights the critical necessity of integrating targeted balance training into rehabilitation protocols for older adults with KOA, ensuring that therapeutic interventions address both physiological instability and its underlying psychological barriers.

MATERIALS AND METHODS

A cross-sectional study was conducted at a local government hospital. Participants were included if they met the following criteria: (1) aged 65 years and above, and (2) diagnosed with unilateral or bilateral radiographic KOA. Respondents were excluded if they had: (1) any uncontrolled non-musculoskeletal diseases such as chronic obstructive pulmonary disease (COPD) or congestive heart failure; (2) a pre-existing neurological disorder affecting lower-limb strength, balance, or ambulation (e.g., poliomyelitis, stroke); (3) any musculoskeletal or orthopedic diseases that may impair ambulation (e.g., rheumatoid arthritis); or (4) dementia or mild cognitive impairment.

The sample size was calculated using G Power 3 analysis, specifically applying a Chi-Square Test of Independence ($df=1$). Assuming a large effect size ($w=0.61$), 28 participants was estimated to provide 90% power with a risk of type 1 error of 0.05. Thus, a final sample size of 34 participants was targeted after considering a 20% attrition rate. Participants were recruited using convenience sampling, and the study protocol was approved by the university ethics committee (FERC/FSK/MR/2022/0225). A consent form was provided to eligible participants to obtain their willingness to participate in the study. Participants then completed a questionnaire that included demographic data, fall history, and other comorbidities.

The 14-item Modified Falls Efficacy Scale (MFES) questionnaire was used to assess FOF (Yin et al., 2023). The questionnaire was administered in English and completed by the participants with the assistance of the researcher to ensure clarity and accurate comprehension of the items. In its original psychometric evaluation, Cronbach's alpha was used to demonstrate the internal consistency of the items on the questionnaire, yielding a value of 0.95, while the overall intraclass correlation coefficients (ICCs) for the MFES was 0.93 (Hill et al., 1996). All items were scored on a 10-point visual analog scale (VAS), where 0 = not confident at all, 5 = fairly confident, and 10 = completely confident (Yin et al., 2023). An average score below 8 categorized the participant as Fearful, whereas a score of 8 or above classified the participant as Not Fearful.

To assess balance and fall risk, the Timed Up and Go (TUG) test was performed. A priori research had demonstrated that the test had good to excellent test-retest reliability (ICCs ranging from 0.86 to 0.92) when administered five times with a one-minute rest interval (Collado-Mateo et al., 2019). Participants were instructed to rise from the chair, walk three meters, turn around, and return to the chair (Collado-Mateo et al., 2019). Timing began when the participant's buttocks was lifted off the seat and stopped when they sat down again (Collado-Mateo et al., 2019; Herman et al., 2011). Participants were instructed to walk at their normal pace. If a walking aid was typically used at home, it was also permitted during the test (Collado-Mateo et al., 2019). Completion times were classified into three risk categories: Normal (< 12 seconds), At Risk of Falling (12–13.9 seconds, reflecting minor gait impairment or early frailty), and High Risk of Falling (14 seconds or more).

Descriptive statistics were used to summarize demographic data, with counts and percentages for categorical variables. The Chi-square test was employed to assess the association between FOF and fall risk.

RESULTS

Characteristics of the Participants

A total of 43 participants were recruited for this study. Most participants (60.5%) were aged 65 to 70 years, and the majority were female (72.1%). The most common health problems reported were non-communicable diseases (NCDs), with diabetes mellitus (DM) and hypertension (HPT), affecting 39.5% of participants. Most participants were diagnosed with bilateral knee OA (81.4%), and 32.6% had experienced a fall within the past year (Table 1).

Table 1: Characteristics of the Participants

Variable	Number	Percentage (%)
Age Group:		
65-70	26	60.5
70-75	12	27.9
75-80	4	9.3
80-85	1	2.3
Gender:		
Male	12	27.9
Female	31	72.1
Diagnosis:		
Unilateral KOA	8	18.6
Bilateral KOA	35	81.4
Comorbidities:		
NCD-DM/HPT/HD	17	39.5
HDL	3	7
HPT/Dyslipidemia	5	11.6
Others	5	11.6
NKMI	13	30.2
Falls History:		
Yes	14	32.6
No	29	67.4

DM: Diabetes Mellitus; HD: Heart Disease; HDL: High-Density Lipoprotein; HPT: Hypertension; NCD: Non-Communicable Diseases; NKMI: No Known Medical Illness

	28	9	6	43
Total	(65.1%)	(20.9%)	(14.0%)	(100.0%)

DISCUSSION

In this study, the majority of participants (88.3%) reported no significant FOF, while only 11.6% exhibited fear. This finding may reflect that participants with KOA were relatively active older adults who attended hospital-based physical assessments and participated in early rehabilitation programs, which are known to help prevent functional decline (Martinez-Velilla et al., 2016). Furthermore, most participants (67.4%) had no history of falls, supporting the notion that regular participation in rehabilitation activities may help maintain balance and confidence in this population.

Despite having KOA, most participants (65%) demonstrated a normal fall risk, possibly due to adequate muscle strength after actively engaging in knee rehabilitation that enables lower-limb muscles to contract under the regulation of the central nervous system to generate corrective torques for maintaining joint stability and balance control (Shen et al., 2024). Moreover, higher levels of fall efficacy is associated with better balance performance and a reduced risk of falls (Arnold et al., 2011; Hicks et al., 2020).

This study also found a significant correlation between FOF and balance, corroborating previous articles by Walankar and Jain (2017) and Fernandes et al. (2024). This finding is consistent with the fear-avoidance model theory, which explains how individuals with musculoskeletal pain may limit activity due to fear, leading to loss of confidence and an increasing fear of pain (Rosadi et al., 2022). Furthermore, high-fear KOA patients often adopt protective movement strategies by reducing weight bearing on the affected side and increasing stress on the contralateral limb. This compensatory mechanism may explain the subsequent development of bilateral KOA following an initial unilateral presentation (Duan et al., 2025). Ultimately, this behavior drives activity avoidance, resulting in reduced mobility and a reinforcing cycle of muscle atrophy, gait disorders, and physiological instability (Delbaere et al., 2010; Mat et al., 2019). This situation strengthens the necessity of evaluating psychological barriers alongside physical impairments in this population.

The recent study by Alkhamis et al. (2026) further reported that elderly patients with KOA with a history of falls presented with poorer TUG performance. A study by Aljuhani et al. (2025) also found that despite having

The Level of Fear of Falling and Balance

About 88.3% of participants reported no FOF, while a smaller proportion (11.6%) expressed fear, as assessed using the MFES. Based on the TUG test results, 65.1% were categorized as having normal mobility with no significant fall risk, whereas 20.9% were identified as at risk of falling, and 14% were classified as having a high risk of falling.

Association between Fear of Falling and Balance

A Chi-Square analysis revealed a significant association between FOF and balance/fall risk, $\chi^2(2, N = 43) = 21.37$, $p < 0.001$. The effect size for this relationship was large (Cramer's $V = 0.71$), indicating a strong link between higher fear levels and impaired objective balance in this population. Table 2 shows the cross-tabulation between FOF and fall risk.

Table 2: Cross-tabulation between FOF and fall risk

FOF	Normal (Low Risk)	At Risk of Falling	High Risk of Falling	Total
Not Fearful	28 (73.7%)	8 (21.1%)	2 (5.3%)	38 (100.0%)
Fearful	0 (0.0%)	1 (20.0%)	4 (80.0%)	5 (100.0%)

undergone total knee arthroplasty (TKA), FOF remains prevalent in this population, even at three months following surgery, compromising their rehabilitation progress. These findings underscore the critical need for a more holistic approach to geriatric orthopedic care. Recognizing FOF as a major barrier to functional recovery allows clinicians to screen vulnerable patients early. Consequently, this shifts the therapeutic focus from isolated joint-focused protocols toward a comprehensive, dual-targeted management strategy that concurrently addresses both objective physical balance impairments and cognitive-behavioral barriers to movement.

This study has several limitations. First, the use of a cross-sectional design means that data were collected at a single point in time, which inherently prevents us from establishing causal relationships between FOF and balance. Second, our reliance on a convenience sampling strategy and a relatively small sample size may limit the generalizability of the findings to the broader population of older adults with KOA. Larger studies utilizing randomized sampling techniques are needed to identify other factors influencing the relationship between FOF and balance. Furthermore, the study did not include a comparison group of older adults without KOA, which limits the ability to determine the relative impact of KOA on fall risk. In addition, the study focused exclusively on KOA and did not account for other comorbidities such as hip OA, cognitive impairment, visual deficits, or muscle weakness, that may also influence balance and fall risk. Future research should involve larger, more diverse samples, employ longitudinal designs, and consider these variables to provide a more comprehensive understanding of fall risk in older adults with KOA.

CONCLUSION

This study highlights a significant association between FOF and balance among elderly individuals with KOA. The findings indicate that although most participants exhibited relatively good balance and a low fall risk, FOF can markedly affect both mobility and postural stability. The analysis further demonstrates a strong association between higher FOF levels and poorer balance performance, underscoring the psychological factors that contribute to fall risk in this population.

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