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The Effect of Knee Injury and Sedentary Behavior on the Incidence of Knee Osteoarthritis at Muhammadiyah Metro General Hospital

W. Azhar Na'im[1], Dyah Wulan Sumekar Rengganis Wardani[2], Susianti[3], Fitria Saftarina[4], Dian Isti Angraini[5]
[1]Master of Public Health, Faculty of Medicine, Lampung University
[2,4,5]Departement of Community Medicine and Public Health, Faculty of Medicine, University of Lampung
[3]Departement of Histology, Faculty of Medicine, University of Lampung
Jl. Prof. Dr. Ir. Sumantri Brojonegoro No. 1, Gedong Meneng, Rajabasa, Bandar Lampung, Lampung 35145, Indonesia

ABSTRACT: Knee osteoarthritis is one of the most common degenerative joint diseases found in adults and the elderly. This disease causes pain, stiffness, limited movement, and impacts the quality of life of sufferers. The risk factors for osteoarthritis are multifactorial, but among the modifiable factors, a history of knee injury and sedentary behavior are of particular concern because they have been shown to contribute to the onset of osteoarthritis. This study aims to determine the relationship between a history of knee injury and sedentary behavior with the incidence of knee osteoarthritis at Muhammadiyah Metro General Hospital. The study design is an observational analysis with a case-control approach. The sample consisted of 152 respondents, comprising 76 cases (patients with knee osteoarthritis) and 76 controls (patients without knee osteoarthritis). Data were collected through interviews using structured questionnaires and medical record reviews. Bivariate analysis was performed using the Chi-square test with odds ratio (OR) calculations and 95% confidence intervals. A total of 38.2% of respondents had a history of knee injury and 12.5% had sedentary behavior. The test results showed a significant relationship between a history of knee injury and the incidence of knee osteoarthritis (p = 0.000; OR = 6.089; 95% CI: 2.913–12.729). In addition, sedentary behavior was also significantly associated with the occurrence of knee osteoarthritis (p = 0.000; OR = 23.276; 95% CI: 3.019–179.476). This study shows that a history of knee injury and sedentary behavior are significant risk factors for the occurrence of knee osteoarthritis in patients at Muhammadiyah Metro General Hospital.

KEYWORDS: Degenerative, History of Knee Injury, Knee Osteoarthritis, Risk Factors, Sedentary Behavior.

INTRODUCTION

Knee osteoarthritis is one of the most common degenerative joint diseases found in adults and the elderly. This disease is characterized by progressive damage to the articular cartilage, subchondral bone changes, osteophyte formation, and symptoms such as pain, stiffness, and limited joint function (Noriega-González et al., 2023). Globally, osteoarthritis is the leading cause of chronic disability, particularly among the elderly, and has been designated a priority disease by the World Health Organization (WHO, 2023). This condition not only impacts the quality of life of sufferers, but also has social and economic consequences due to decreased productivity and increased healthcare costs (Leifer et al., 2022; Mobasheri & Batt, 2016).

Risk factors for knee osteoarthritis are diverse, ranging from non-modifiable factors such as age and gender to modifiable factors such as obesity, history of injury, and lifestyle (Katz et al., 2021; Silverwood et al., 2015).Among the modifiable risk factors, a history of knee injury and sedentary behavior are two variables that have been proven to have a significant influence on the occurrence of knee osteoarthritis.

Knee injuries, whether due to acute trauma or repetitive physical activity, can cause damage to important structures such as ligaments, menisci, and cartilage. This damage causes joint instability, alters mechanical load distribution, and accelerates cartilage degeneration. Systematic reviews and meta-analyses show that individuals with a history of knee injury have a 4–6 times higher risk of developing knee osteoarthritis, particularly in cases of anterior cruciate ligament (ACL) injury (, 2019; Snoeker et al., 2020). This makes knee injuries one of the main predisposing factors in the pathogenesis of knee osteoarthritis. In addition, lifestyle factors also play a role in worsening joint conditions. Sedentary behavior, which is an activity with very low energy expenditure, such as sitting for too long or lack of physical activity, can reduce muscle strength and joint flexibility. This condition causes a decrease in knee stability and increases the risk of joint damage. Research reports that sedentary behavior can increase the risk of knee

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osteoarthritis by up to 72% compared to physically active individuals (Master et al., 2021; Tatjana, 2023). Furthermore, a sedentary lifestyle is also associated with decreased physical function, increased disability, and lower quality of life in people with osteoarthritis (Zhaoyang & Martire, 2019).

Based on this description, a history of knee injury and sedentary behavior are important risk factors that contribute to the increasing prevalence of knee osteoarthritis.

METHOD

This study is an observational analytical study with a case-control design conducted in April–May 2025. The study population consisted of all patients who visited the Orthopedic Clinic at Muhammadiyah Metro General Hospital. The study sample consisted of 152 respondents, comprising 76 cases (patients with knee osteoarthritis) and 76 controls (patients without knee osteoarthritis). The sampling technique used purposive sampling. The inclusion criteria were patients aged ≥40 years, having complete medical records, and willing to be respondents by signing an informed consent form. The exclusion criteria were patients with a history of joint diseases other than knee osteoarthritis. Primary data were obtained through interviews with structured questionnaires to assess knee injury history and sedentary behavior. Secondary data were obtained from patient medical records regarding the diagnosis of knee osteoarthritis confirmed by an orthopedic specialist based on clinical and radiological examinations. Data analysis was performed using bivariate analysis with the Chi-square test to determine the relationship between a history of knee injury and sedentary behavior with the occurrence of knee osteoarthritis. Results were presented in the form of p-values, odds ratios (OR), and 95% confidence intervals.

RESULTS

There were 152 respondents in this study, all of whom were patients at the Muhammadiyah Metro General Hospital, consisting of 76 people with knee osteoarthritis and 76 people without knee osteoarthritis. The frequency distribution of respondents based on the research variables is shown in Table 1, which presents the characteristics of the respondents as follows:

Table 1. Characteristics of Respondents

Characteristics	Frequency	Percentage
Age		
≥ 45 years	136	89.5
< 45 years	16	10.5
Gender		
Male	37	24.3
Female	115	75.7
Osteoarthritis Incidence		
Knee OA	76	50
No OA	76	50
Knee Injury History		
Yes	58	38
None	94	61.8
Sedentary behavior		
Yes	19	12.5
None	133	87.5

Based on the respondent characteristics table, 89.5% of respondents were aged ≥ 45 years, and 75.7% were female. In this study, 50% of the 152 respondents suffered from knee osteoarthritis. A history of knee injury was found in 38.2% of respondents, while 61.8% of respondents had no history of knee injury. It was found that 12.5% of respondents experienced sedentary behavior and the other 87.5% did not experience sedentary behavior.

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Table 2. Relationship Between History of Knee Injury and Occurrence of Knee Osteoarthritis

	Group		Total (%)	*p-value*	OR	95% CI	
	Knee OA (%)	No Knee OA (%)				*Low*	*Up*
History of Knee Injury							
Yes	44 (75.9)	14 (24.1)	58 (100)				
None	32 (34.1)	62 (65.9)	94 (100)	0.000	6,089	2,913	12,729
Total	76 (50)	76 (50)	152 (100)				

The results of the analysis of the relationship between a history of knee injury and the incidence of osteoarthritis show a striking difference in distribution. Of the 58 respondents with a history of knee injury, 44 (75.9%) had knee osteoarthritis, while only 14 (24.1%) did not. Conversely, among the 94 respondents without a history of knee injury, only 32 people (34.1%) had osteoarthritis, while the majority, 62 people (65.9%), did not have osteoarthritis. The *Chi-square* test results showed a significant relationship between a history of knee injury and the occurrence of knee osteoarthritis (p = 0.000). Respondents with a history of knee injury had a 6.089 times greater risk of developing knee osteoarthritis compared to respondents who did not have a history of injury.

Table 3. Relationship between Sedentary Behavior and the Incidence of Knee Osteoarthritis Group

	Group		Total (%)	*p-value*	OR	95% CI	
	Knee OA (%)	No Knee OA (%)				*Low*	*Up*
Sedentary Behavior							
Yes	18 (94.7) 58	1 (5.3)	19 (100)	0.000	23.276	3,019	179,476
None	(43.6)	75 (56.4)	133 (100)				
Total	76 (50)	76 (50)	152 (100)				

The results of the analysis of the relationship between behavior and the occurrence of knee osteoarthritis showed that 19 respondents with sedentary behavior, almost all of whom (18 people, or 94.7%) suffered from knee osteoarthritis, while only 1 person (5.3%) did not. Conversely, in the non-sedentary group (133 respondents), 58 people (43.6%) had knee osteoarthritis, while 75 people (56.4%) did not. The Chi-square test also showed a significant relationship between sedentary behavior and the occurrence of knee osteoarthritis (p = 0.000). Respondents with high sedentary behavior had a 23.276 times greater risk of developing knee osteoarthritis compared to respondents with low sedentary behavior.

DISCUSSION

This study proves that a history of knee injury is significantly associated with the occurrence of knee osteoarthritis. Respondents with a history of injury are more than six times more likely to suffer from osteoarthritis than respondents who have never experienced injury. These results are consistent with a systematic review showing that knee joint injuries, particularly anterior cruciate ligament (ACL) and meniscus tears, increase the risk of knee osteoarthritis by 4–6 times (Poulsen et al., 2019).

Pathophysiologically, knee injuries are an important risk factor in the development of osteoarthritis. Injuries such as anterior cruciate ligament (ACL) tears and meniscus damage can cause an imbalance in load distribution on the joint, disrupt knee stability, and alter normal movement patterns, increasing pressure on cartilage structures. This condition leads to mechanical damage and chronic inflammation that triggers joint degeneration (Zhang et al., 2023). Knee trauma can also cause intra-articular bleeding, which reduces the quantity and quality of synovial fluid. This decrease accelerates cartilage degeneration, especially if not properly

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treated. The pathological process after trauma is progressive, starting with acute swelling in the first week to the seventh week, followed by subchondral and trabecular bone remodeling, proteoglycan depletion, and finally cartilage erosion in the eighth week (Ali et al., 2018). In addition to mechanical disturbances, knee injuries also trigger a local inflammatory response. Research by Nieboer et al. (2023) shows that within the first 72 hours after acute knee injury, there is an increase in the concentration of inflammatory proteins such as IL-6, IL-1β, TNF, and CCL4 in the synovial fluid. Although most inflammatory responses return to normal within 3 weeks, this short-term increase still affects the microstructural balance of joint tissue and triggers chronic degenerative processes in susceptible individuals. The implications of these findings are the importance of primary prevention strategies, such as education on proper exercise techniques, the use of knee protection during high-risk activities, and muscle strengthening exercise programs to reduce the risk of injury. For patients who have already suffered an injury, comprehensive rehabilitation is crucial to prevent progression to osteoarthritis. This approach includes physical therapy, neuromuscular stabilization exercises, mechanical load control, and post-trauma inflammation monitoring.

In addition to injury history, this study also identified sedentary behavior as a very strong risk factor for knee osteoarthritis. The analysis showed that respondents with sedentary behavior were more than 23 times more likely to suffer from osteoarthritis than active respondents. These findings reinforce the results of previous studies which stated that a sedentary lifestyle increases the risk of osteoarthritis, exacerbates pain, reduces functional capacity, and accelerates disease progression (Master et al., 2021; Zhaoyang & Martire, 2019). One of the main mechanisms of this relationship is muscle atrophy due to lack of physical activity, which leads to decreased knee joint stability, as well as joint stiffness due to lack of functional movement needed to maintain soft tissue elasticity and joint flexibility. This combination can increase pressure on the articular cartilage and accelerate structural damage to the joint. In addition, sedentary behavior also has an impact on local and systemic metabolic disorders, including decreased blood circulation and reduced nutrient supply to the articular cartilage. Cartilage that does not receive adequate nutrients and oxygen will be more prone to degeneration, especially when accompanied by other risk factors such as advanced age or obesity (Ma et al., 2024). Sedentary behavior is also closely related to an increased risk of obesity, which is known to be a major risk factor for osteoarthritis. Excessive body fat accumulation puts additional mechanical stress on the knee joints as the main support for body weight. In addition, adipose tissue produces proinflammatory adipokines and cytokines such as IL-6 and TNF-α, which reinforce the chronic inflammatory process in the knee joint, worsening cartilage damage and accelerating the progression of osteoarthritis (Deguchi et al., 2022). Epidemiological studies show that individuals who spend more time sitting tend to have more severe pain complaints, poorer physical function, and faster radiological progression of osteoarthritis (Zhaoyang & Martire, 2019).

The practical implication of these findings is the importance of lifestyle-based interventions to reduce sedentary behavior. Interventions can include educating patients about the risks of sedentary behavior, promoting appropriate physical activity, and exercise programs tailored to the condition of osteoarthritis patients. Simple interventions such as stretching or walking lightly after sitting for long periods have been shown to be effective in maintaining joint function and improving the quality of life of osteoarthritis patients.

CONCLUSION

This study shows that a history of knee injury and sedentary behavior are significant risk factors for the occurrence of knee osteoarthritis in patients at Muhammadiyah Metro General Hospital. Respondents with a history of knee injury had a risk approximately six times higher of developing osteoarthritis compared to respondents without a history of injury. Meanwhile, respondents with sedentary behavior were more than twenty-three times more likely to develop osteoarthritis than those who were physically active.

Interventions such as knee injury prevention, comprehensive post-injury rehabilitation, and promotion of physical activity to reduce sedentary behavior are very important. Targeted promotional and preventive efforts are expected to reduce the incidence of knee osteoarthritis and improve the quality of life of people at risk.

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