
ARTICLE INFO

AUTHOR'S AFFILIATIONS

Faculty of Medicine,
 University of Jember¹
 Department of Surgery,
 Dr. Soebandi Regional
 Hospital, University of
 Jember²

CORRESPONDING

AUTHOR

Ika Rahmawati Sutejo
 Faculty of Medicine,
 University of Jember

E-mail:

ikarahmawati.fk@unej.ac.id

Article history

Received 01-04-2023
 Revised 09-09-2023
 Accepted 23-09-2023
 Available online 30-09-2023

**Please cite this article in
 APA 7th edition style as:**

Pratama, R. S., Indreswari,
 L., & Sutejo, I. R. (2023).
 The Occupational Risk
 Factors Associated with
 Hip Osteoarthritis in
 Agricultural Communities
 in Jember. *Jurnal Ilmiah
 Kedokteran Wijaya
 Kusuma*, 12(2), 151-157,
<http://dx.doi.org/10.30742/jikw.v12i2.2811>

The Occupational Risk Factors Associated with Hip Osteoarthritis in Agricultural Communities in Jember
Ristianto Yoga Pratama¹, Laksmi Indreswari^{1,2}, Ika Rahmawati Sutejo^{1}*

Abstract

Occupational risk factors have a significant effect on osteoarthritis (OA). It has been studied before. However, no one has looked into occupational risk for the prevalence of hip OA in agricultural communities of Jember. This study aims to determine the relationship between risk factors (gender, age, body mass index, work history, work posture, length of work, and length of work) and hip OA incidence. This analytical observational study uses a cross-sectional design at Doctor Soebandi Jember's Regional Hospital and Jember Clinic Hospital, East Java-Indonesia. This study included all hip OA patients who visited the orthopedic clinic from January 2020 to December 2021. Thirty-six patients and 18 samples had hip OA (50%). Of eighteen subjects with hip OA, 14 were female (77.8%), 12 were aged ≥55 years old (66.7%), 12 were pre-obese with BMI >25 (66.7%), 14 had a history of lifting heavy weights (77.8%), 16 related to bending working posture (88.9%), 13 had a long working year >10 years (72.7%), 11 had a long working duration >44 hours (61.1%), 9 worked as a housewife and farmers (50%). A significant relationship of hip OA was observed with gender (p-value 0.003), age (p-value 0.019), work posture (p-value 0.002), length of work (p-value 0.003), and duration of work (p-value 0.018) based on contingency coefficient statistical analysis. We can conclude that the significant risk factors related to hip osteoarthritis in agricultural areas are gender, age, work posture, work length, and work duration.

Keywords: farmer, hip osteoarthritis, occupational risk, posture of work

Original Research Article

INTRODUCTION

Osteoarthritis (OA) is a degenerative disease that can lead to disability. OA affects body tissue through cartilage degeneration, inflammation, bone changes, muscle weakness, joint deformities, functional impairment, and pain, so it causes disability (Damen et al., 2019; Sandiford et al., 2020). OA is the most common rheumatic disease worldwide, affecting approximately 303 million people in 2017 (Kloppenborg & Berenbaum, 2020). Knee and hip joints are the most commonly affected by OA. The global prevalence of symptomatic hip OA in individuals over 30 is 3% (Katz et al., 2021).

However, research on hip osteoarthritis has been limited to a few countries. A study conducted in Finland revealed a high prevalence of musculoskeletal disorders, particularly osteoarthritis, among farmers and traders due to their involvement in activities requiring heavy lifting (Holmberg et al., 2002). Another study from Sweden, based on hospital patient data, demonstrated an increased risk of knee and hip osteoarthritis among firefighters, construction workers, household assistants, tradespeople, and farmers who worked more than 32 hours per week (Holmberg et al., 2004) in farmer with male gender had a risk of hip fracture lower 20% according to age, compared to other occupations

(Johansson et al, 2018). Furthermore, United States census data indicated that individuals with more than ten years of work experience had a 29% prevalence of knee complaints and a 15% prevalence of pelvic pain (Damen et al., 2019).

The prevalence of osteoarthritis (OA) in Indonesia among individuals over 60 years old is approximately 5% for both men and women (Suari et al., 2015). However, the prevalence of hip OA in Indonesia, particularly in agricultural areas like Jember, is relatively small due to limited epidemiological studies. Research conducted at Arifin Ahmad Pekanbaru Hospital indicated that 8.6% of 198 sampled patients suffered from hip OA (Suari et al., 2015). Similarly, a study at Sanglah Hospital Denpasar showed that 18.9% of 90 sampled patients experienced hip OA (Putra et al., 2019).

Jember is located in East Java and 954 km away from the capital city of Indonesia, Jakarta. It has the most significant number of farmers in East Java, with 426,584 (BPS, 2019), making them more susceptible to hip OA. Occupational risk factors for muscular disorder among farmers have been studied before (Hasheminejad et al., 2021), such as carrying a weight of more than 10 kg might cause knee pain (Poochada et al., 2022). However, no one has looked into occupational risk for the incidence of hip OA in agricultural communities, especially in Jember. The study explores the relationship between risk factors such as gender, age, body mass index (BMI), work history, work posture, length of work, duration of work, and hip osteoarthritis. By identifying the risk factors influencing hip OA incidence, this research provides valuable education to farmers, enabling them to avoid activities that can lead to OA and ultimately prevent the disease.

MATERIALS AND METHODS

This research is an analytical observational study that utilizes a cross-sectional design. The population of this study were patients who visited the orthopedic polyclinic at Regional Hospital Dr. Soebandi Jember and Jember Klinik Hospital between January 2020 and December 2021. Thirty-six participants were included in the study: eighteen patients with hip OA and eighteen did not suffer from hip OA. The inclusion criteria for the sample group were all patients diagnosed with hip osteoarthritis based on medical history, physical examination, and imaging study. Patients with hip OA experienced symptoms such as pain in the hip area, usually worse with weight-bearing activities, and may improve with rest; stiffness in the hip joint, especially in the morning or after periods of inactivity; swelling; and reduced range of motion. Radiographic findings revealed joint space narrowing, osteophytes, sclerosis, and deformities in the femoral head and acetabulum (Sandiford et al., 2020). The orthopedic polyclinic patients who did not suffer from hip OA were selected by simple random sampling. Exclusion criteria included patients with a history of trauma such as ligament rupture and pelvic fracture, those with metabolic disorders such as hyperuricemia, and those with congenital pelvic bone abnormalities. The Faculty of Medicine, University of Jember's ethics team approved the research protocol with the ethic number 1567/H25.1.11/KE/2022.

The risk factors of hip OA in this study included age, gender, body mass index (BMI), length of work, duration of work, history of lifting weights, and work posture. The diagnoses of hip OA were obtained from the patient's medical records. The researchers collected occupational data, which included information on the history of lifting weights, work posture, length of work, and duration of work; missing data of medical records; and other necessary data through research questionnaires. The data were analyzed using SPSS 20.0 statistical analysis software. Quantitative variables, including age and BMI, were reported as mean \pm standard deviation (SD). Categorical variables, such as gender, length of work, duration of work, history of lifting weights, work posture, and occupation, were reported as frequency and percentage. The relationship between variables was determined using the contingency coefficient statistical test, with a significance level set at $p \leq 0.05$.

RESULTS

This study included 36 patients with a mean age of 51.9±12.76 y.o, a mean BMI of 24.7±2.6, and 18 of whom had OA of the hip (50%). Of 36 patients, 19 participants are females (52.8%). Nineteen participants are ages <55 y.o (52.8%). Eighteen participants were classified as pre-obese due to the BMI category for Asians>25 (50%). Twenty-one participants have a history of lifting heavy weights of >40 kg/day (58.3%). Twenty-three participants are closely related to bending activities (63.9%). Nineteen participants have work periods of 1-10 years (52.8%). Sixteen participants have a working duration of >44 hours/week (44.4%). The distribution of work shows that housewives (25%) and farmers (22.2%) are the most common jobs of patients.

Table 1 showed that from 18 patients with hip OA, 14 participants were female (77.8%), 12 participants were aged ≥55 years old (66.7%), 12 participants were pre-obese with BMI >25 (66.7%), 14 participants had a history of lifting heavy weights (77.8%), 16 participants related to bending working posture (88.9%), 13 participants had a long working year >10 years (72.7%), 11 participants had a long working duration >44 hours (61.1%), 9 participants worked as a housewife and farmers (50%). The contingency coefficient statistical test shows there is a significant relationship between age (p-value 0.019), work posture (p-value 0.002), length of work (p-value 0.003), and duration of work (p-value 0.018) on the incidence of hip OA patients.

DISCUSSION

This study revealed that hip OA patients were dominated by women, age ≥55 y.o, pre-obese & obese (BMI >25), had a history of lifting heavy weights, related to bending working posture, had a long working year >10 years, and had a long working duration >44 hours, even though statistical test shows there is a significant relationship only between age, work posture, length of work, and duration of work. Various factors influence the incidence of OA. The internal factor associated with hip OA is dysplasia, an undercover acetabulum about the femoral head, and hip morphology linked with femoroacetabular impingement syndrome (FAIS), or cam and pincer morphology. Cam morphology is an aspherical femoral head, and pincer morphology is an overcoverage of the acetabulum relative to the femoral head. Both pincer and cam morphology can result in an abutment between the proximal femur and the acetabulum during motion, which may cause intra-articular injury (Casartelli et al., 2021). Other factors correlate with hip OA are genetic susceptibility; age; arthritis of the knee and finger joints, which is more common in women; systemic variables, such as metabolic problems; work activity; and participation in specific sports, such as long-distance running (Knapik et al., 2018).

This research reveals that females are at a higher risk of developing hip osteoarthritis (OA) than males. Framingham OA Study reported a 1.7-fold higher incidence of hip OA in postmenopausal women than men (Park et al., 2017). This may be related to decreased levels of the hormone estrogen during menopause. Estrogen plays a role in inhibiting osteoclast activity, thereby inhibiting bone remodeling. When estrogen levels decrease due to menopause, osteoclast activity increases, causing OA (Kloppenborg & Berenbaum, 2020). As a result, carrying out a high workload experiences decremented bone function, which can contribute to OA development (Chaganti & Lane, 2011). Conversely, men have a higher incidence of hip OA than women who have not yet experienced menopause (Chaganti & Lane, 2011).

This research demonstrates that individuals aged 55 years and older face a higher risk of developing hip osteoarthritis (OA). An examination of symptomatic hip OA within the Johnston County study cohort revealed a prevalence increase of 5.9% in the 45-54 age group, escalating to 17% in the >75-year age group (Martel-Pelletier et al., 2016). The prevalence and incidence of hip OA in women over 55 are linked to a decline in estrogen. The aging process impairs the joint's capacity to regenerate under biomechanical stress. This is attributed to changes in articular cartilage, such as the thinning of non-calcified cartilage, joint weakness, which predisposes individuals to joint loading through activities like weight lifting and walking, a history of cartilage damage due to physical activity, and other age-

related factors (Peters et al., 2018). Several studies have established a correlation between increasing age and the development of hip OA. Subjects aged 30 to 65 exhibited a tenfold increase in OA incidence in the hands, hips, and knees (Hamood et al., 2021). Structural hip deformities (including those contributing to femoroacetabular impingement syndrome) are strong predictors of early-onset hip OA (Ackerman et al., 2017).

Table 1. Risk factor distribution of hip osteoarthritis

| Variables | Hip Osteoarthritis | | | | p-value |
|-----------------------------------|--------------------|------|----------|------|---------|
| | Positive | | Negative | | |
| | N | % | N | % | |
| Gender | | | | | |
| Male | 4 | 22.2 | 13 | 72.2 | 0.003* |
| Female | 14 | 77.8 | 5 | 27.8 | |
| Ages_years | | | | | |
| <55 | 6 | 33.3 | 13 | 72.2 | 0.019* |
| ≥55 | 12 | 66.7 | 5 | 27.8 | |
| Body Mass Index | | | | | |
| Underweight (BMI < 18.5) | 0 | 0.0 | 1 | 5.6 | 0.1 |
| Normal (BMI 18.5-22.9) | 5 | 27.8 | 11 | 61.1 | |
| Overweight (BMI 23-24.9) | 1 | 5.6 | 0 | 0.0 | |
| Pre-obese & obese (BMI >25) | 12 | 66.7 | 6 | 33.3 | |
| History of Lifting Weights | | | | | |
| Light (<30 kg/day) | 3 | 16.7 | 9 | 50.0 | 0.59 |
| Moderate (30-40 kg/day) | 1 | 5.6 | 2 | 11.1 | |
| Heavy (>40 kg/day) | 14 | 77.8 | 7 | 38.9 | |
| Work Posture | | | | | |
| Not Bending | 2 | 11.1 | 11 | 61.1 | 0.002* |
| Bending | 16 | 88.9 | 7 | 38.9 | |
| Length of Work | | | | | |
| Short (<10 years) | 5 | 27.8 | 14 | 77.8 | 0.003* |
| Long (>10 years) | 13 | 72.2 | 4 | 22.2 | |
| Duration of Work | | | | | |
| Short (<40 h/week) | 2 | 11.1 | 10 | 55.6 | 0.018* |
| Moderate (40-44 h/week) | 5 | 27.8 | 3 | 16.7 | |
| Long (>44 h/week) | 11 | 61.1 | 5 | 27.8 | |

*p-value ≤ 0.05 considered as significant

Although patients with hip osteoarthritis (OA) generally exhibited a pre-obese body mass index (BMI) in this study, it is evident that BMI is not a significant risk factor for OA. These findings align with Reijman’s study, which discovered that while BMI is associated with the incidence and progression of knee OA, it does not have the same association with hip OA (Reijman, 2007). The underlying mechanism linking BMI to knee OA involves changes in joint mechanical loading, which does not apply to the hip joint. This discrepancy can be attributed to anatomical differences, as the knee joint functions as a hinge joint, whereas the hip joint is a ball-and-socket joint. While malalignment can pose problems in a hinge joint, it is not as significant in a ball-and-socket joint (Andersen et al., 2012; Hardiyanti et al., 2020). Furthermore, another study states that BMI does not contribute to the progression of superolateral migration of the femoral head, which is a causative factor in hip OA (Teirlinck et al., 2019).

This research indicates that a history of lifting heavy weights is not a significant risk factor for osteoarthritis (OA). Cumulative heavy lifting working time (CLWT) is unrelated to osteoarthritis (OA). This is because lifting heavy objects is often done while standing, aligning the burden with the long

bone's axis. Additionally, weightlifting is an endurance activity that increases muscle strength in the lower extremities, which benefits bone density. As a result, lifting big weights helps keep our muscles strong and prevent OA (Park et al., 2017).

In contrast, this study highlights that other occupational factors significantly impact the incidence of hip OA, particularly the work posture, length of work in years, and duration of work in hours. Prolonged and repetitive use of joints during work over an extended period can contribute to OA. Various occupations involving repetitive joint use, such as factory workers, coal miners, and agricultural workers, have been shown to increase the exposure of joints. Multiple studies have observed an increased risk of hip OA in individuals who have worked for an extended period exceeding ten years (Swastini et al., 2022). Specifically, farming for ten years or more has been associated with a 9.3 times higher risk of OA (Poochada et al., 2022). Morphological anomalies of the hip joint are an accumulation of specific daily actions for hours over several years. Hip OA is linked to specific activities: sitting, standing, or bending for 2 hours per day; kneeling or squatting for 30 minutes per day; running for 1 hour per day; climbing ladders; ascending 30 flights of stairs per day; manually lifting or moving weights weighing 56 lbs; and driving for 4 hours per day (Webber et al., 2020).

Farmers experience hip OA at a frequency two to eight times higher than the general population. Among farmers in agricultural communities, engaging in bending activities and carrying heavy weights on the back are associated with hip OA. In this context, the primary cause of hip OA is the load exerted on the hip joint during heavy lifting activities against gravity and adopting non-ergonomic body positions (Schram et al., 2020). Bending activities and carrying heavy weights on the back also alter the anterior spinal inclination while standing, reduce mobility in the thoracolumbar spine, and increase cumulative hip loading during walking (Tateuchi, 2019). These factors contribute to the development of hip OA. Moreover, according to Muraki et al. (2011) reported that workers in agriculture, forestry, and fisheries have the highest prevalence of kneeling, squatting, walking, lifting weights, and carrying heavy loads on their backs (Lidaka et al., 2020). Notably, kneeling and squatting positions are associated with knee OA incidence (Maghfiroh et al., 2022).

Diagnosing hip OA in agricultural areas presents challenges because people in agriculture prioritize work over their health status. Despite researchers collecting data from the two largest hospitals in Jember over two years using total sampling, they encountered a limited number of hip OA patients. This can be attributed, in part, to the overall decrease in hospital visits during the COVID-19 pandemic. Nonetheless, the researchers hope that the sample size they obtained represents the agricultural community in Jember, Indonesia

CONCLUSION

It can be concluded that hip osteoarthritis (OA) is a multifactorial disease within the agricultural community. This study identified several risk factors that influence the development of hip OA, including gender, age, and occupation (specifically, working posture, length of work, and duration of work). Interestingly, body mass index (BMI) and lifting heavy weights were found to have no association with hip OA. This result begins to develop recommendations for preventing hip OA in the agricultural community to perform work ergonomically and limit the number and duration of such activities. Future research to identify specific risk factors for work-related hip OA should focus on applying rigorous research methods with quantitative exposure measures and objective diagnostic criteria.

CONFLICT OF INTEREST

All authors declare that there is no conflict of interest in this study

ACKNOWLEDGEMENTS

None

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