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Conference Paper

The Association Between Pain and the Risk of Falling in the Elderly With Knee Osteoarthritis

Sri Sunaringsih Ika Wardojo[1], Rakhmad Rosadi[1]*, Suci Amanati[2], Yudha Wahyu Putra[3], Barrah[1]

[1]Physiotherapy Department, Faculty of Health Science, University of Muhammadiyah Malang, Indonesia
[2]Physiotherapy Department, Widya Husada Semarang University, Indonesia
[3]Physiotherapy Department, University of Widya Dharma Klaten, Indonesia

ORCID
Rakhmad Rosadi: https://orcid.org/0000-0002-7321-0506

Abstract.
The risk of falling is a major problem for the elderly with knee osteoarthritis. Factors that increase the risk of falling include postural disorders caused by pain. Severe pain affects the functional activities of the elderly. This might lead to weakened muscles and exacerbate the loss of postural control or impaired balance, which increases the risk of falling. This study aimed to analyze the correlation between pain and the risk of falling in the elderly in Malang. It was conducted through a cross-sectional study with 53 participants recruited from a healthcare center in Malang. These participants were all diagnosed with knee osteoarthritis and were aged above 55 years old. The VAS scale was used to measure the pain level, while the Hopkins Falls Grading scale was used to measure the risk of falling. The Spearman test analysis showed that there was a significant correlation between pain and the risk of falling ($r = 0.46$, $p < 0.05$).

Keywords: pain, risk of fall, knee osteoarthritis, elderly

Corresponding Author: Rakhmad Rosadi; email: rakhmad21[1]@gmail.com

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1. Introduction

Aging is a condition in human life that must be experienced as a person ages. The aging process does not occur in a certain condition, but continues from the beginning to the end of a person's age (death). Aging causes health problems in the form of weakness, limitations and inability in terms of physical so that the quality of life in the elderly decreases. One of the problems experienced by the elderly is knee inflammatory disease caused by degenerative physiology of the body or commonly called osteoarthritis. Osteoarthritis (OA) is a degenerative joint disorder that involves cartilage and other surrounding tissues. In addition to the breakdown and loss of articular cartilage, there is subarticular bone remodeling, osteophyte formation, ligament laxity, periarticular muscle weakness and in some cases, synovial inflammation. These changes can occur as a result of an imbalance between joint tissue damage and repair [1].

OA can occur in any joint, especially the knees, hips, hands, spine and feet [1]. Knee OA has a higher prevalence rate than other types of OA because the knee joint is the largest joint and supports body weight when standing or walking. OA of the knee usually occurs in adults with a median age of 65 years or older, with a prevalence in the US of 33.6% (12.4 million) [2].

The main symptoms of knee OA include joint pain, stiffness, and limitation of movement [1]. However, pain is the main complaint that most often appears in patients with OA. Parents who experience chronic pain prefer to avoid activities for fear of falling [3]. In patients with OA pain can arise from irritation of the nerve endings in the synovium by osteophytes, or periarticular muscle spasm, decreased blood flow in the bone and increased intraosseous pressure and synovitis followed by the release of prostaglandins, leukotrienes, and various cytokines. Motion pain is pain that often occurs in patients with OA, this is caused by the periosteum that is no longer protected due to cartilage thinning, so friction between bones when moving can cause pain [4].

Pain in patients with OA can alter neuromuscular control, as well as the excitability of the affected muscle. Joint protection and ability to produce movement is an acute response. The neural pathways that cause these changes are unknown, but changes in spinal reflex pathways affect sensory signals in the central nervous system through pre- and postsynaptic inhibition. After that, structural problems occur due to articular damage, joint effusion and secondary muscle atrophy causing reduced muscle strength and joint instability. Pain can also interfere with cognitive function and alter neural processes that are important for balance control, thereby increasing the risk of falling [3].

In addition to pain, there are also limitations in movement. Limited range of motion or decreased LGS is usually associated with osteophyte formation in the bone, uneven joint surfaces due to severe joint cartilage loss, or spasm and contractures of periarticular muscles and contractures of the ligaments that stabilize the joints around the OA. Osteoarthritis results in an imbalance between regeneration and degeneration resulting in softening, splitting and peeling of the cartilage layer of the joint known as the corpus libera which can cause pain and locking when the joint moves [4].

Pain contributes to functional decline, this is because the compensation for movement that occurs due to the neuromuscular effects of pain results in muscle weakness. muscles that are not moved for a long time will cause atrophy so that they lose their flexibility. Muscle weakness can also arise from a lack of physical activity or from the direct effect of pain on the muscles, referred to as reflex muscle inhibition. Other factors

can be changes in gait or adaptation to chronic pain that causes instability and balance disorders so that the risk of falling in the elderly increases.

The risk of falling is one of the big problems for the elderly. Falls can cause many health problems and unwanted events. These incidents can be in the form of skin injuries, broken bones, head injuries, bleeding, impaired physical mobility and even death [5]. Besides that, it can also cause psychological trauma, prolong treatment time and treatment costs can increase due to using diagnostic equipment that doesn't actually need to be done, such as CT Scans, X-rays, etc. The impact on hospitals can pose a risk of lawsuits because they are considered negligent in patient care [6]. So this study aims to identify the characteristics of pain and joint range of motion in the elderly with knee OA, and explain the relationship between pain and joint range of motion on the risk of falling in the elderly with knee OA.

2. Method

2.1. Study Design and Participants

The risk of falling is one of the big problems for the elderly. Falls can cause many health problems and unwanted events. These incidents can be in the form of skin injuries, broken bones, head injuries, bleeding, impaired physical mobility and even death [5] . Besides that, it can also cause psychological trauma, prolong treatment time and treatment costs can increase due to using diagnostic equipment that doesn't actually need to be done, such as CT Scans, X-rays, etc. The impact on hospitals can pose a risk of lawsuits because they are considered negligent in patient care [6]. So this study aims to identify the characteristics of pain and joint range of motion in the elderly with knee OA, and explain the relationship between pain and joint range of motion on the risk of falling in the elderly with knee OA.

This study used an observational analytic research design using a cross-sectional study approach. While the sampling technique in this study is a purposive sampling technique, namely the selection of samples based on the criteria that have been determined by the researcher. The inclusion criteria included: Subjects suffering from knee osteoarthritis with a diagnosis by a doctor or based on medical records, aged 50 years or older, referred to health services or rehabilitation for less than a year. While the exclusion criteria included: the subject did not understand Indonesian, had had knee surgery, had problems with the nervous system such as hemiplegia, had a history of periarticular fractures, and had a history of rheumatoid arthritis.

2.2. Measurements

2.2.1. Pain

Pain was measured using the Visual Analog Scale (VAS). VAS is a visual image that contains the level of pain complaints which are divided into 0-10 in cm with a level of 0 being no pain and 10 being the most severe pain. The VAS measurement is carried out to determine the level of pain complaints of patients by giving a number according to what is felt by using a data ratio scale.

2.2.2. Fall Risk

The risk of falling was measured using the Hopkins Falls Grading Scale (HFGS) which is a measurement method using a questionnaire to measure the severity of falls in respondents during the last 1 year. The data scale used is ordinal where the data are classified based on falling and not falling.

2.3. Statistical Analysis

The data in this study were processed using the IBM SPSS for windows version 20.0 application with P-values <0.05, which means it is considered statistically significant. Variable testing on the relationship between pain and joint range of motion on the risk of falling using the Mann-Whitney test.

3. Results and Discussion

Based on the results of statistical tests carried out, it was found that there was a relationship between pain and LGS on the risk of falling in the elderly at the Rampal Cilaket Public Health Center, Malang City, East Java. This is in accordance with the research of [3] which states that the elderly with knee pain have a double risk of falling compared to people without knee pain. [7] also said that the elderly with high knee pain had a more than 60% increased risk of falling compared to those with less pain.

According to [8] Osteoarthritis is the main disease process that contributes to joint pain in the elderly in addition to low back pain. As pain increases, balance worsens, postural stability oscillations increase, which increases the risk of falling.

Pain in patients with OA is caused by structural changes in the joints, bone microfractures, and intra-articular hypertension due to swelling, synovial hypertrophy, and accompanying synovitis. Joint stiffness resulting from a mild inflammatory process usually occurs in the morning and lasts less than 30 minutes. Crepitation is limited range of motion, and the deformity results from osteophyte formation, bone remodeling and cartilage loss. While the function of osteophytes is to support and stabilize joints, they can also produce pain, crepitus, and decreased joint range of motion [9]. Meanwhile, according to [10] Pain is caused by swelling (synovitis) in the joints that causes pain and discomfort. Pain can appear after doing activities or movements, this is due to the thinning of the cartilage which causes bones and bones to rub against each other during movement, causing pain. However, the pain may decrease after rest. Pain in patients with OA can alter neuromuscular control, as well as the excitability of the affected muscle. Pain can also interfere with cognitive function and alter neural processes that are important for balance control, thereby increasing the risk of falling [3]. Pain contributes to functional impairment and muscle weakness leading to limited mobility and an increased risk of falling. The neuromuscular effects of pain can lead to weakness of the leg muscles. Muscle weakness can arise from a lack of physical activity or from the direct effect of pain on the muscles, referred to as reflex muscle inhibition. Other factors can be changes in gait or adaptation to chronic pain that causes instability and impaired balance.

According to Anggriani et al., (2018) the decrease in ROM in patients with OA also occurs due to compensation for pain. Pain is a very disturbing factor so that the muscles will automatically protect themselves by limiting the range of motion of the joints and capsular pattern disorders. Indirectly, the elderly will reduce knee movements to avoid pain. If this is done for a long time will result in atrophy and weakness in the muscles around the knee, resulting in a decrease in muscle flexibility which affects poor posture. Poor postural control will make it difficult for the elderly to maintain a balanced body position so that they are at risk for falling.

In a study conducted for one month at the Rampal Cilaket Public Health Center, Malang City regarding the relationship between pain and ROM to the risk of falling, it found several obstacles such as the difficulty of getting respondents because elderly activities during the pandemic were not held. limited space in the field.

4. Conclusion

In summary, this study identified that pain and decreased LGS were associated factors with falling. elderly with OA have an average LGS value below normal. While the pain felt on average was moderate pain. Pain makes the elderly choose to avoid functional activities, which can cause a decrease in LGS in the long term. Decreased LGS results in weakened muscles and exacerbates loss of postural control or impaired balance that can increase the risk of falling. So that there is a relationship between pain and LGS on the risk of falling in the elderly with knee OA.

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