Research Article

Association between the degree of Osteoarthritis and pain level of patients at Baptist Hospital, Batu City

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ABSTRACT

Osteoarthritis is a chronic disease characterized by the destruction of cartilage in the joints, causing stiffness, pain, and impaired movement. The condition most commonly affects the joints of the knees, hands, feet, spine, and often the shoulders and hips. Knee osteoarthritis is a major public health problem that causes chronic pain and reduces physical function and quality of life. This study determined the relationship between the degree of Osteoarthritis and the pain level in patients at Baptist Hospital, Batu City. This research used a cross-sectional study with 31 respondents. Data collection was conducted directly using the WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index) questionnaire, modified in Indonesian. To determine the grade of Osteoarthritis using the Kellgren-Lawrence system. The results showed that out of 31 respondents, there were nine patients (29%) who had grade 1 osteoarthritis, 12 patients (38.7%) had grade 2, and 10 patients (32.3%) had grade 3. There were 22 patients (71%) who had a mild pain level, four patients (13%) had a moderate level, and five patients (16%) had a severe pain level. The Spearman correlation test showed no significant relationship ($p>0.05$) between the degree of Osteoarthritis and the level of pain in patients. This study concludes that there was no relationship between the increasing degree of Osteoarthritis and the level of pain.

INTRODUCTION

Osteoarthritis is the most common degenerative joint disease. The disease causes progressive pathological changes in osteoarthritis joints, including articular cartilage damage, subchondral bone thickening, osteophyte formation, synovial inflammation, ligament degeneration, and knee meniscus and joint hypertrophy (Chen *et al.*, 2017). Osteoarthritis can affect any joint but most commonly affects the knees, hands, hips, and spine. This disease considerably impacts the patient, resulting in pain, disability, and social impact. In addition, the economic burden of Osteoarthritis on patients and society is quite significant (Kloppenburg & Berenbaum, 2020).

Knee osteoarthritis contributes to >80% of the total burden of Osteoarthritis, which is directly caused by joint tissue damage, but specific causes of the high prevalence of Osteoarthritis remain unclear. Recently, two dominant factors causing knee osteoarthritis were found to be increasing age, which causes the tissue to age and accumulate more burden, and the second factor, a high body mass index (BMI), resulting in joint overload and inflammation caused by excess fat (Wallace *et al.*, 2017). Determination of the degree of knee osteoarthritis using the Kellgren-Lawrence method based on X-ray images of the knee joint. Each picture will be assigned a value from 0 to 4. Grade 0 indicates there is no osteoarthritis and grade 4 shows severe Osteoarthritis (Sukhikh *et al.*, 2020).

Approximately 654.1 million people (aged >40 years) with knee osteoarthritis in 2020 worldwide. The prevalence of Osteoarthritis in Indonesia is still high, with 1.69 million females and 1.39 million males. Osteoarthritis is the most common type of arthritis and is one of the causes of disability worldwide (Budiman & Widjaja, 2020).

The main symptom of Osteoarthritis is pain (Bacon *et al.*, 2020). Pain is a sensory or emotional discomfort associated with potential or actual tissue damage (Kumar & Elavarasi, 2016). The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) test is used to assess knee osteoarthritis patients' pain levels and severity. It has three subscales: pain (5 items), stiffness (2 items), and physical function (17 items) (Seifeldein *et al.*, 2019).

This study aimed to determine the association between the degree of Osteoarthritis and the pain level in patients at Baptist Hospital, Batu City. This study hypothesizes that there is a significant association between the degree of Osteoarthritis and the pain level.

METHODS

This research used a cross-sectional study. The participants in this study were osteoarthritis patients at Baptist Hospital's Orthopaedic and Traumatology Department from April to May 2020. Sampling used a total sampling technique, where all of the population was sampled (Sugiyono, 2017). The inclusion criteria for this study were patients with knee osteoarthritis who had radiological results confirmed by a Baptist hospital radiologist and were willing to be interviewed. Exclusion criteria were patients with knee pain caused by other diseases such as infection, rheumatoid arthritis, or gouty arthritis. The Kellgren-Lawrence system is used to assess the degree of knee osteoarthritis through radiographs of the patient. The Kellgren-Lawrence system has four grades (0-4); the higher the degree of Osteoarthritis, the higher the severity (Sukhikh *et al.*, 2020). The WOMAC test was used to determine 3 dimensions of pain, stiffness, and physical function with questions 5, 2, and 17, respectively. The Likert version of WOMAC was rated on an ordinal scale of 0 to 4 according to severity (none, mild, moderate, severe, and

extreme). Each subscale is summed with a maximum score of 20, 8, and 68, respectively (Seifeldein *et al.*, 2019). The research data was analyzed using the Spearman correlation test.

RESULTS

The total respondents in this study were 48 patients. Based on the inclusion and exclusion criteria, the appropriate criteria were 31 respondents (Table 1).

Based on age characteristics, the majority of osteoarthritis patients were >60 years old (68%), and based on gender, most of the patients were female (71%). Based on the degree of Osteoarthritis, it was most commonly found in grade 2 (38.7%), followed by grade 3 (32.3%). In addition, most of the osteoarthritis

patients were found to have mild pain levels (71%) (Table 1). Patients in grades 1, 2, and 3 most experienced mild pain levels, at 22.5%, 26%, and 22.5%, respectively (Table 2). In this study, there were no patients with grade 4 osteoarthritis.

Analysis of the relationship between the degree of Osteoarthritis and the level of pain in patients was measured using the Spearman Rank test with a P-value of 0.911, which indicates a probability value > significant value (α). The interpretation of these results is that there is no significant association between the degree of Osteoarthritis and the level of pain in knee osteoarthritis patients at Baptist Hospital, Batu City.

Table 1. General characteristics of respondents

Characteristics		n	%
Age	<60	10	32%
	>60	21	68%
	Total	31	100%
Gender	Males	9	29%
	Females	22	71%
	Total	31	100%
Degree of Osteoarthritis	Grade 1	9	29%
	Grade 2	12	38.7%
	Grade 3	10	32.3%
	Grade 4	0	0%
	Total	31	100%
Pain level	Mild (0-40%)	22	71%
	Moderate (40-70%)	4	13%
	Severe (70-100%)	5	16%%
	Total	31	100%

Table 2. Characteristic relationship between the degree of osteoarthritis and the level of pain

Degree of Osteoarthritis	Pain Level						Total		P-value
	Mild		Moderate		Severe				
	n	%	n	%	n	%	n	%	
Grade 1	7	22.5%	1	3.2%	1	3.2%	9	29%	
Grade 2	8	26%	0	0%	4	12.9%	12	38.7%	
Grade 3	7	22.5%	3	9.7%	0	0%	10	32.3%	0.911
Grade 4	0	0%	0	0%	0	0%	0	0%	
Total	22	71%	4	12.9%	5	16.1%	31	100%	

DISCUSSION

This research uses a cross-sectional study with 31 respondents. Based on the results of the study, the distribution of respondents by age showed that most of the respondents were elderly people who were more than 60 years old. There were 21 patients. These results are in accordance with the research of Subroto *et al.* (2021), which states that patients with ages more than 60 years are at high risk for knee osteoarthritis. According to Supartono *et al.* (2018), anyone over the age of 65 is at a high risk of developing calcification of the knee joint. The aging process causes tissue swelling and the release of cartilage-toxic chemicals, leading to increasing deterioration.

The gender distribution of respondents showed that most respondents were females, with 22 patients (71%) (Table 1). These findings, similar to Subroto, Supartono, and Herardi's (2021) research, found that females were more likely than males to suffer from knee osteoarthritis. Females are more susceptible to knee osteoarthritis, particularly after menopause, which is caused by the regulation of estrogen (Johnson & Hunter, 2014). The majority of the respondents (48.6%) had knee Osteoarthritis grades 2 and 3, according to the distribution depending on the degree of knee osteoarthritis (Table 1). According to Ali (2017) research, patients diagnosed with knee osteoarthritis were more usually detected in grades 3 and 4.

Osteoarthritis is characterized by pain and interruption of joint function as a result of cartilage damage (Enohumah & Imarengiaye, 2008). In individuals with knee osteoarthritis, activities including ascending stairs, getting out of a chair, and running create pain (Felson, 2006). The findings revealed that 22 of the 31 patients had mild pain levels, 4 had moderate pain, and 5 had severe pain (Tables 1 and 2). These results are similar to the research by Bacon *et al.* (2020), who explained that the loss of cartilage thickness has a weak correlation with knee pain. The association with pain may be partly mediated by changes in synovitis and may have a greater effect on those without previously had knee pain than on patients with existing knee pain. According to research by Neogi *et al.* (2010), the variability of pain in osteoarthritis patients might be explained by daily adaptations to overcome pain and avoid activities that cause pain.

Osteoarthritis occurs because it involves many factors, such as trauma, inflammation, biochemical reactions, and metabolic disorders. In addition, it is known that cartilage tissue is not the only one involved, given the lack of blood vessels and nerves in cartilage, so it is unable to produce inflammation or pain. Therefore, the source of pain comes from changes in the

non-cartilaginous components of the joint, such as the joint capsule, synovium, subchondral bone, ligaments, and periarticular muscles. As Osteoarthritis progresses, these structures are affected and change, including bone remodeling, osteophyte formation, weakening of the periarticular muscles, ligament laxity, and synovial effusions that become more pronounced (Mora *et al.*, 2018). The occurrence of inflammation plays an essential role in the development of Osteoarthritis in some patients and is also a cause of chronic pain. This triggers a series of events driven by inflammatory mediators such as proteases, prostaglandins, neuropeptides, and cytokines (Fu *et al.,* 2018).

In a univariate analysis of a cohort study of patients with knee osteoarthritis, we discovered that several variables, including psychosocial, sociodemographic, disease, and medication, were all significantly associated with higher knee pain scores. Following multivariate analysis, higher pain scores were found to be associated with Hispanic or Native American ethnicity, opioid use, and depression. This demonstrates that, even if there is no relationship between pain scores and the severity of Osteoarthritis, discrepancies in results have been observed in previous studies. Hispanic or Native American ethnicity, age, opioid prescription, fibromyalgia, drug use, antidepressant prescription, alcohol use, gabapentinoid prescription, health insurance status, smoking, previous knee injections, and treatment recommendations are all associated with knee osteoarthritis pain levels. The surgical versus nonsurgical treatment of Osteoarthritis, as a result, age, gender, BMI, race/ethnicity, substance abuse, and psychological variables such as depression, hopelessness, overall well-being, and social stress have all been studied about reports of osteoarthritis-related pain (Eberly *et al.*, 2018).

According to Arenndt-Nielsen (2017), significant and continuous nociceptive input might cause central nervous system sensitization. High levels of sensitization are linked to increased discomfort, disability, and a decreased quality of life. There is frequently a weak or no link between tissue damage and the degree of pain in the corresponding tissues in people with Osteoarthritis. Other factors that influence the use of the WOMAC questionnaire can cause this. The WOMAC questionnaire is a validated pain scale, but it only measures pain over a short period, whereas pain in Osteoarthritis is chronic pain associated with an activity that changes over time (Wu *et al.*, 2020). There are several causes of pain, such as synovial inflammation, capsular fibrosis, and muscle fatigue (Sampiere, 2010). Osteoarthritis pain is heterogeneous, varying between individuals and with different phases of the illness. The mechanisms underlying osteoarthritis pain are complicated, and they are influenced by a variety of psychosocial factors (Fu *et al.*, 2018). The basis for the progression of Osteoarthritis and the neurophysiological correlations are still not fully understood. In recent years, the nervous system's role in the development and manifestation of Osteoarthritis has become clearer. As the disease progresses, neurological changes that occur as the disease progresses will eventually lead to sensitization, resulting in the patient having more pain than expected compared to the actual structural joint damage (Arenndt-Nielsen, 2017).

The Spearman correlation test was used to determine the relationship between the degree of Osteoarthritis and the level of pain suffered by patients in this study. The research revealed a P-value of 0.911, indicating that there is no statistically significant association between the degree of Osteoarthritis and the level of pain in patients at Baptist Hospital, Batu City. According to another study by Khairina *et al.* (2018), the pain level is unrelated to Osteoarthritis's radiological grading.

This study had various flaws, including a small sample size because it was conducted during the COVID-19 outbreak, which limited the number of participants. Nonetheless, this study can be used as a guideline in the treatment of knee osteoarthritis, allowing patients with Osteoarthritis to improve their quality of life through their activities and motions.

CONCLUSION

From the results of this study, it can be concluded that there is no association between the degree of Osteoarthritis and the level of pain in patients at Baptist Hospital, Batu City.

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