Research article

Is there any correlation between physical activity and severity of knee osteoarthritis in secondary referral hospital in Indonesia?

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ABSTRACT

Introduction and Aim: Osteoarthritis is a pathological condition of the joints that is degenerative and progressive, affecting two-thirds of people over 65 years of age, with a prevalence of 1.39 million among males and 1.69 million in females. The main clinical manifestation of osteoarthritis is joint pain. The incidence and progression of knee osteoarthritis are strongly influenced by risk factors, consisting of systemic factors including age, sex, hormonal factors, and biomechanical factors such as obesity, physical activity, and muscle weakness. The purpose of this study was to determine if there was a relationship between physical activity, the severity of knee osteoarthritis and the level of pain based on the Kellgren-Lawrence system in gender.

Materials and Methods: This research was conducted in a cross-sectional design with 26 participants at Baptis Hospital in Batu City. As references for the interview, the GPPAQ and the WOMAC questionnaire were used. The Kellgren-Lawrence system is used to assess knee osteoarthritis.

Results: The Spearman correlation test results showed no significant relationship between physical activity and the severity of knee osteoarthritis, and no significance between physical activity and the degree of pain in general or by gender.

Conclusion: There was no statistically significant relationship between physical activity with the severity of knee osteoarthritis and the level of pain in males and females patients at Baptis Hospital in Batu City.

Keywords: Degree of pain; Kellgren-Lawrence; knee osteoarthritis; physical activity; severity of osteoarthritis.

INTRODUCTION

Osteoarthritis is a pathological condition in the joints where there is a loss of cartilage in the synovial joint area with sclerosis in the underlying bone and is followed by changes in other joint tissues (1). Pain, stiffness, and swelling are common symptoms of osteoarthritis, as are limitations in daily activities (2). Osteoarthritis often affects the joints of the knees, hands, feet, and spine and is also commonly found in the shoulder and hip joints (3). In 2020, approximately 654.1 million people (aged 40 years and over) worldwide have knee osteoarthritis. Globally, the prevalence of knee osteoarthritis was 16% in people aged 15 and over, and 22.9% in people aged 40 and over. The prevalence and incidence of knee osteoarthritis were 1.69 million in females and 1.39 million in males (4). The hip and knee are parts of the body that have a high prevalence of osteoarthritis in the elderly (1).

The main manifestation of osteoarthritis is pain in the joint. The mechanism of pain in knee osteoarthritis is not fully understood, but it involves synovial pathology and subchondral bone (5). Signs and symptoms of osteoarthritis include chronic pain and stiffness, which contribute to patients’ functional limitations. Persistent and uncontrolled pain conditions can hurt the patient’s quality of life because they cause emotional distress or anxiety, impair functional capacity, and hinder the ability to fulfill roles in family, society, and work (6). The incidence and progression of knee osteoarthritis are strongly influenced by systemic and biomechanical factors. Systemic factors consist of age, gender, and hormonal factors. Biomechanical factors consist of obesity, physical activity, and muscle weakness (7).

Physical activity is a component of human life that is closely related to the daily lives of people over the age of 15 who are actively working and doing physical activities (8). Physical activity's role as a risk factor for osteoarthritis is questionable. Physical activity, on the other hand, improves the strength of the muscles surrounding the joints, maintains and increases joint mobility, and increases the diffusion of substances that nourish the articular cartilage and anabolic processes. Meanwhile, physical activities such as sports with excessive loads can trigger cartilage damage and are considered unsafe for individuals with osteoarthritis. This is because repeated impacts and loads that arise during physical activity can damage
joint cartilage and cause subchondral bone calcification (7). This research aims to determine the correlation between a patient’s physical activity and the degree and level of pain of knee osteoarthritis at Bapts Hospital, Batu City.

**MATERIALS AND METHODS**

**Patients and study design**

From April to May 2020, a cross-sectional study was conducted. The participants in this study were Orthopaedic and Traumatology patients from Bapts Hospital in Batu City, East Java, who had knee osteoarthritis. There are some inclusion criteria for this research: age between 16-84 years, patients with knee osteoarthritis who had an X-ray photo, a willingness to fill out the informed consent, and a willingness to be interviewed. Patients with knee pain caused by a disease other than osteoarthritis, such as rheumatoid arthritis or gout arthritis, or patients with another disease, such as fracture, tumor, or osteomyelitis, were excluded from the study.

**Ethical approval**

The Ethical Committee of the Faculty of Medicine, Universitas Brawijaya, reviewed and approved this research proposal (No 73/EC/KEPK/03/2020).

**Methods**

The General Practice Physical Activity Questionnaire (GPPAQ) was used to measure the level of physical activity of adults (16-74 years), and it consisted of seven questions about the type and amount of physical activity at work, walking pace, and hours spent on five different activities in the previous week. Furthermore, the Physical Activity Index (PAI) will be divided into four categories: active, moderately active, moderately inactive, and inactive. (9). The second was the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), which used 5, 2, and 17 questions to assess three dimensions of pain, stiffness, and physical function. The severity of the WOMAC Likert version is rated on an ordinal scale of 0 to 4 (none, mild-moderate, severe, and extreme) (10). The Kellgren-Lawrence system grades knee osteoarthritis, and there are four grades: 0-4 (none, doubtful, minimal, moderate, and severe) (11).

**Statistical analysis**

The Spearman correlation was used to analyze the data in this study to determine the relationship between physical activity with the degree of knee osteoarthritis and the level of pain.

**RESULTS**

The total respondents were 35 patients, but only 26 complied with the inclusion and exclusion criteria. Among 26 patients with knee osteoarthritis, 11 patients (42.3%) were aged <60 years, and 15 patients (57.7%) were aged >60 years. Based on gender, there were 18 males patients (69.2%) and 28 females patients (30.8%). There are nine patients (34.6%) with knee osteoarthritis grade 1, eight patients (30.8%) grade 2 and nine patients (34.6%) grade 3. For physical activity characteristics, there are nine patients (34.6%) inactive, eight patients (30.8%) intermediate inactive, three patients (11.5%) intermediate active, and six patients (23.1%) active physical activity (Table 1).

<table>
<thead>
<tr>
<th>Characteristics</th>
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<tbody>
<tr>
<td><strong>Age</strong></td>
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<tr>
<td>&lt;60</td>
<td>11</td>
<td>42.3%</td>
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<tr>
<td>&gt;60</td>
<td>15</td>
<td>57.7%</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>100%</td>
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<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
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<tr>
<td>Male</td>
<td>18</td>
<td>69.2%</td>
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<tr>
<td>Female</td>
<td>8</td>
<td>30.8%</td>
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<tr>
<td>Total</td>
<td>26</td>
<td>100%</td>
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<tr>
<td><strong>Grade of osteoarthritis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 1</td>
<td>9</td>
<td>34.6%</td>
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<tr>
<td>Grade 2</td>
<td>8</td>
<td>30.8%</td>
</tr>
<tr>
<td>Grade 3</td>
<td>9</td>
<td>34.6%</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>100%</td>
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<tr>
<td><strong>Physical activity</strong></td>
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<tr>
<td>Inactive</td>
<td>9</td>
<td>34.6%</td>
</tr>
<tr>
<td>Intermediate inactive</td>
<td>8</td>
<td>30.8%</td>
</tr>
<tr>
<td>Intermediate active</td>
<td>3</td>
<td>11.5%</td>
</tr>
<tr>
<td>Active</td>
<td>6</td>
<td>23.1%</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>100%</td>
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<tr>
<td><strong>Level of pain</strong></td>
<td></td>
<td></td>
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<tr>
<td>Mild</td>
<td>7</td>
<td>65.4%</td>
</tr>
<tr>
<td>Moderate</td>
<td>5</td>
<td>19.2%</td>
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<tr>
<td>Severe</td>
<td>4</td>
<td>15.4%</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>100%</td>
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</table>

The Spearman Rank test result was 0.901, indicating a probability > level of significance (α). According to the findings, there is no correlation between physical activity and the severity of knee osteoarthritis. The analysis resulted in 0.843, indicating that there is no significant relationship between physical activity and the degree of knee osteoarthritis in male patients. The analysis resulted in a 0.718 correlation between physical activity and the level of pain in patients with knee osteoarthritis, indicating that there is no significant relationship between physical activity and the degree of knee osteoarthritis in female patients. And, according to the results analysis, the relationship between physical activity and the level of pain in patients with knee osteoarthritis was 0.285, indicating that there is no significant relationship between physical activity and the level of pain in knee osteoarthritis.

**DISCUSSION**

The P-value for the Spearman correlation was 0.901, indicating that there is no significant relationship between physical activity and the severity of knee osteoarthritis. These findings are consistent with those of Gates et al., (12) who discovered that physical

**Table 1: Frequency distribution of respondents**
activity, such as walking or cycling, is not associated with knee osteoarthritis, and that time spent on physical activity is not associated with the incidence of knee osteoarthritis. Kemnitz et al., (13) also revealed that based on muscle strength, which is also related to physical activity, there was no significant relationship between muscle strength and radiographic progression of osteoarthritis. The result of a systematic review by Esculier et al., (14) also found that there is a high level of uncertainty among the general public and health practitioners in Canada regarding the association between physical activity, and knee joint health.

The results of a systematic review by Herzog et al., (15) found different results from our research. These significant results were found in individuals who did not have radiographic features of knee osteoarthritis and decreased their walking speed over a month period, which may increase the risk of worsening radiographic features of knee osteoarthritis over the next 24-month period. The role of physical activity in osteoarthritis is still being questioned because the exact cause is unknown. There are several research results regarding physical activity and different degrees of knee osteoarthritis. The differences in research results may occur due to different types of physical activity that lead to a different risk of joint injury or protection from osteoarthritis. Other factors that support these differences are the use of osteoarthritis outcome measurement instruments such as self-reported osteoarthritis, knee replacement, and MRI or radiography, as well as the possible impact of physical activity that is different from the previous studies (16).

High exposure to exercise in early life is associated with an increased risk of knee or hip osteoarthritis, so an assessment of lifelong physical activity is required (17). Meanwhile, because this study was based on GPPAQ questionnaire scoring, which was assessed based on the respondent’s physical activity in the previous week, it was less effective in demonstrating a relationship between physical activity and the worsening of knee osteoarthritis or changes in the severity of knee osteoarthritis (18).

Soccer and weight lifting, as well as regular or intense exercise, such as ex-athletes or sports teachers, and knee-bending activities, are frequently associated with an increased risk of osteoarthritis. Furthermore, physical activities involving light joint loads, such as long-distance running, swimming, walking, golf, and other sports that do not increase the risk of worsening knee or hip osteoarthritis, are thought to play a protective role (18). In addition, there is no evidence that physical activity of fewer than 10,000 steps per day accelerates the progression of osteoarthritis (19).

The Spearman correlation test result for male was $p = 0.091$ and for female it was $p = -0.084$, indicating that there was no gender-specific difference in the relationship between physical activity and osteoarthritis. These results are similar to Ageberg et al., (18) who states that there is a weak but not significant correlation between physical activity in leisure time and an increase in the degree of knee and hip osteoarthritis.

A systematic review by Zhu et al., (20) stated different results, that moderately active levels of physical activity can be protective in increasing osteophytes on MRI examinations in a population of females with radiographic features, obesity, and knee injuries. Thus, moderately active physical activity is beneficial for individuals with knee osteoarthritis who are at high risk. However, this study did not result in a significant association in males without obesity, without radiographs, and without knee injury. Dell’isola et al., (21) stated that the weakness of the knee extensor muscles is also closely related to physical activity, an important risk factor in the radiographic progression of knee osteoarthritis in females without knee mal-alignment.

The systematic review by Kraus et al., (19) stated different results from this research. Physical activity has been shown to reduce pain, improve physical function, and improve health-related quality of life in patients with knee and hip osteoarthritis when compared to less active adult osteoarthritis patients. This is similar to the Lo et al., (22) study which found that the ability to relieve knee pain does not cause aggravation of pain or radiographic and structural progression. Based on the findings of the study, it can be concluded that the relationship between physical activity and the level of pain experienced by people with knee osteoarthritis is significantly influenced by the type of physical activity.

This study has some limitations, such as the minimal number of samples used because it was conducted during the COVID-19 pandemic and therefore it was not possible to conduct further patient interviews. The research instrument used is the GPPAQ questionnaire, which can only measure physical activity in the past week, so the history of previous physical activity cannot be recorded. Nonetheless, this research can be used as a guide for further research.

CONCLUSION

The findings of this study shows that there is no correlation between physical activity and the severity of knee osteoarthritis or its level of pain in male and female patients at Baptis Hospital in Batu City. Further research is needed to provide a broader picture to develop this reference, such as adding other risk factors for the occurrence of osteoarthritis, such as diabetes mellitus. In addition, the number of samples can be increased in order to better represent the population.
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CONFLICT OF INTEREST

The authors of this work have nothing to disclose.

REFERENCES

22. Lo, G.H., Musa, S.M., Driban, J.B., Kriska, A.M., McAlindon, T.E., Souza, R.B. et al., Running does not increase symptoms or structural progression in people with knee osteoarthritis: Data from the osteoarthritis initiative. HHS Public Access [Internet]. 2018 [cited 2022 May 23]; 37(9):1-16.

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