Correlation of Radiological Severity of Genu Osteoarthritis (Kellgren and Lawrence) with Functional Disabilities (Womac Score)

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Abstract

Background: Osteoarthritis (OA) is a degenerative disease that most often causes functional disabilities. The complaints that most often cause functional disabilities in people with OA are pain and stiffness. The severity of OA can be seen radiologically. The aim of this study was to assess the correlation of radiological severity of OA (Kellgren and Lawrence) with functional disabilities (WOMAC score). **Method**: This type of research is an analytic observational study with a cross sectional design. The population who became the respondents of this study were patients suffering from knee osteoarthritis at the Medical Rehabilitation Installation of Dr. Mohammad Hoesin Hospital, Palembang in November 2018 who met the inclusion criteria. Samples were taken by consecutive sampling technique. The functional ability of the patient will be assessed using the WOMAC score and the severity of OA radiologically interpreted based on the Kellgren and Lawrence criteria. **Result**: Statistical test used Somer's correlation test. From 32 respondents' data, it was found that there was no significant correlation between the radiological severity of OA and functional disability (p = 0.097). **Conclusion**: There is no significant correlation between radiological severity of OA (Kellgren and Lawrence) with functional disabilities (WOMAC score).

Keywords: Osteoarthritis, Functional Disability, WOMAC, Kellgren and Lawrence.

1. Introduction

Osteoarthritis (OA) is a joint disease commonly found in older adults and is often known as joint "wear and tear". It is recently recognized that osteoarthritis is a degenerative disease that can affect the entire joint, including the cartilage, joint lining, ligaments, and bones[1]. It is the most common musculoskeletal condition, is chronic in nature, and involves thinning of the cartilage in the joints, causing friction between the bones and causing stiffness, pain, and movement disorders[2].

According to data from the World Health Organization or WHO, osteoarthritis is the 5th highest cause of disability in populations of high-income countries and is ranked 9th in low and middle income countries. Osteoarthritis accounts for 50% of the total disease burden in the musculoskeletal field, which means it is the highest burden in the musculoskeletal disease group besides rheumatoid arthritis and osteoporosis. About 80% of cases of osteoarthritis that occur will be followed by limited movement and 25% of them cannot carry out daily activities[3].

One way to diagnose osteoarthritis is through a radiological examination. Plain radiology can also be used for study purposes and see the joint narrowing that occurs to determine the progression of the disease[4]. Radiological assessment of the severity of osteoarthritis can be carried out using several methods, namely the Ahlbäck or Kellgren and Lawrence classification. In this study, the radiological assessment of the degree of osteoarthritis would use the Kellgren and Lawrence classification.

The Kellgren and Lawrence classification is a reliable and valid criterion used to determine the degree of osteoarthritis. The Kellgren and Lawrence classification is also widely used to help establish the diagnosis and epidemiological studies of knee OA and is accepted by WHO as a criterion that can be used to determine the severity of OA. This Kellgren and Lawrence classification is applied specifically to assess the degree of knee osteoarthritis which is grouped into five categories, namely category zero to category four. The zero category indicates no (normal) features of osteoarthritis, while category four provides a picture of grade osteoarthritis[5]. Radiological findings can provide an image of narrowing of the joint space, osteophyte formation, and subchondral sclerosis and subchondral cysts[6].

The classic symptoms commonly felt by osteoarthritis sufferers are joint pain and stiffness. These two symptoms most often cause disruption in the function of physical activity to cause disability in the sufferer. Functional disability is a term that describes the inability of the body or the limitations of bodily functions to do a job[7]. There are several measurement criteria that can be used to see how much functional activity is experienced by osteoarthritis sufferers, including Lequesne algo functional city, The Knee injury and Osteoarthritis Outcome Score (KOOS), and The Western Ontario and McMaster Universities Osteoarthritis index (WOMAC). In this study, the WOMAC score will be used to evaluate how much functional disability is experienced by people with osteoarthritis. The WOMAC questionnaire will assess the degree of pain, stiffness, and physical activity in people with OA. The WOMAC questionnaire is the most widely used measurement for knee and hip osteoarthritis. This questionnaire has been translated into 90 languages worldwide. Reliability, validity, and intercultural adaptability have been studied extensively in many different populations[8].

Research conducted by Rajpoot, et al. stated that there is a significant relationship between the degree of radiological osteoarthritis using Kellgren and Lawrence and the level of functional disability of OA patients who were assessed using the WOMAC questionnaire. The correlation between the two variables is still not explained. Szebenyi, et al. concluded that there is a strong correlation between pain and osteophyte formation and subchondral bone sclerosis. Increased pain occurs with the expansion of osteophyte formation and subchondral sclerosis[9,10].

Several studies stated that there was no

correlation between the radiological severity of osteoarthritis and the functional disability experienced by osteoarthritis sufferers. The absence of a correlation between the two variables was due to the study sample that did not represent functional ability on the spectrum of osteoarthritis severity. In the study of Cubukcu, Sarsan and Alkan, most of the research samples were mild OA sufferers, while severe pain that could aggravate functional disabilities in OA patients was thought to be closely related to the severity of OA degrees[11]. In contrast, Barker, et al. In his research, only taking research samples from people with severe OA and surgical management will be carried out.

In this study the sample used was not limited to new patients or to patients with advanced OA only. It is intended that the spectrum of OA severity experienced by patients varies from mild to severe so that it can be seen whether there is a radiological correlation between the severity of osteoarthritis genu and functional disabilities experienced by osteoarthritis sufferers. This study aims to determine the radiological correlation of the severity of genu osteoarthritis (Kellgren and Lawrence) with functional disabilities (WOMAC score) in the Hospital Medical Rehabilitation Installation. Mohammad Hoesin Palembang.

2. Metode

The type of research used in this research is analytic observational with cross sectional design. The research was conducted in November 2018.

This research took place at the Medical Rehabilitation Installation Section of the dr. Mohammad Hoesin Palembang.

The study population was patients suffering from knee osteoarthritis at the Medical Rehabilitation Installation of dr. Mohammad Hoesin Palembang in the period November 2018.

Sampling in this study was carried out by means of consecutive sampling, namely all knee osteoarthritis patients at the Medical Rehabilitation Installation of dr. Mohammad Hoesin Palembang, who met the inclusion and exclusion criteria, was taken sequentially until the required minimum number of sample units. This sampling technique is part of a good non-probability technique. Some clinical research uses this technique in sampling (Prihanti, 2018).

Inclusion criteria were all patients with a diagnosis of knee osteoarthritis at the Medical Rehabilitation Installation of dr. Mohammad Hoesin Palembang. Patients with knee OA aged 30 years and over. Male and female OA patients, patients who had radiological results of the knee joint diagnosed with osteoarthritis, at least 3 months before participating in the study. Patients who are willing to participate in research.

The exclusion criteria were patients who had previously participated in this study. Patients with other joint diseases of the knee, such as gout and rheumatoid arthritis. Deaf and blind patients. Patients who have had orthopedic surgery.

The independent variable is the severity of knee osteoarthritis based on Kellgren and Lawrence's criteria.

Unrestricted variable is the level of functional disability of patients with knee osteoarthritis based on the WOMAC score.

Data were analyzed to see the significance of the correlation between the independent and dependent variables. The data was processed using the Statistical Package for Social Science (SPSS) program and presented in the form of univariate and bivariate data analysis. Univariate analysis was used to determine statistical measures for age group, sex, radiologically exposed knee joint, WOMAC score, and degree of OA. Bivariate analysis was used to express the correlation between the dependent variable and the independent variable. Bivariate data analysis in this study tested the correlation of data on the ordinal-ordinal scale using Somer's correlation test. There is a significant correlation between the two tested variables if it has a significant p value ($p < 0.05$).

3. Result

This study was an observational analytic study with a cross sectional design. This study aims to determine the correlation of the radiological severity of OA genu (Kellgren and Lawrence) with functional disabilities (WOMAC score). Data were collected in November 2018. There were 32 patients who came to the Medical Rehabilitation Installation at Mohammad Hoesin Hospital Palembang in November 2018 and had met the inclusion and exclusion criteria for the study. Data were obtained by conducting interviews with knee OA patients at the RSMH Medical Rehabilitation Installation, to assess the functional degree, namely the patient's ability to perform activities. The patient's osteoarthritis degree was seen through the radiological results after the respondents were interviewed.

The general characteristics of the study respondents included age, gender, and radiologically affected knee joints.

Respondent Age

Characteristics of research respondents at the RSMH Medical Rehabilitation Installation based on age groups are presented in **Table 1**.Of the 32 study respondents, most were in the ≥60 years age group (56.3%), followed by the 51-60 years age group (40.6%) and at least the 41-50 years age group (3.1%).

Respondent Gender

Research respondent data based on gender can be seen in **Table 2**. Of the 32 OA patients, 71.9% were women and 28.1% were men.

Knee Joints of Respondents Affected by Radiologic Osteoarthritis.

As shown in **Table 3**, out of 32 study respondents, 22 patients (68.8%) experienced OA in both knee joints, 6 patients (18.9%) experienced OA only in the right knee joint, and 4 patients (12, 5%) had OA only in the left knee joint.

Distribution of Research Respondents Based on WOMAC Score

The distribution of research respondents based on the WOMAC score was divided into three categories, namely mild, moderate, severe (see **Table 4**). Of the 32 research respondents, 19 (59.4%) of them had mild WOMAC scores, 12 respondents (37.5%) had moderate WOMAC scores, and 1 study respondent (3.1%) had severe WOMAC scores.

Distribution of Research Respondents Based on Radiological Severity of OA.

The distribution of respondents based on the radiological severity of OA can be seen in **Table 5**. Of the 32 study respondents, there were 14 respondents (43.8%) suffering from moderate OA, 11 respondents (34.4%) had minimal degree of OA, 6 respondents (18.8%) suffered from doubtful OA, and 1 respondent (3.1%) had severe OA.

Bivariate analysis was used to determine the radiological correlation of the severity of OA genu (Kellgren and Lawrence criteria) with functional disabilities (WOMAC score). In this study, the variables analyzed were unequal variables, therefore the correlation test used was Somer's 13 test.

The correlation of the radiological severity of OA genu with functional disabilities using the WOMAC score can be seen in Table 6.Of the 32 study respondents, there were 6 respondents (18.8%) who experienced OA with questionable severity, of which 4 (12.5%) including mild functional disabilities and 2 respondents (6.3%) suffering from moderate functional disabilities. None of the study respondents with doubtful severity experienced severe functional disability. Meanwhile, OA at the definite severity level was experienced by 11 respondents (34.4%), of which 9 (28.1%) had mild functional disabilities and 2 respondents (6.3%) had moderate functional disabilities. No study respondent with doubtful severity suffered from severe functional disability. In the moderate OA degree classification, there were 14 study respondents (43.8%) of which 5 (15.6%) had mild functional disabilities, 8 respondents

(25.0%) had moderate functional disabilities, and there were 1 respondent (3.1%) with severe functional disabilities. There was 1 research respondent (3.1%) with a severe classification of OA degrees even though the WOMAC score stated that the functional disability experienced by these respondents was still on a mild scale.

The correlation value of 0.233 indicates a positive correlation with a weak correlation strength. The p value obtained from Somer's correlation test is 0.097 (p > 0.05). These results indicate that there is no significant correlation between the radiological severity of genu OA and functional disability.

Table 1.Distribution of Research Respondents by Age Group (N = 32)

Age Group	N	%
41 – 50 years	1	3.1
51 – 60 years	13	40.6
≥ 60 years	18	56.3
Total	32	100

Table 2. Distribution of Research Respondents by Gender (N = 32)

Gender	N	%
Male	9	28.1
Female	23	71.9
Total	32	100

Table 3. Distribution of Research Respondents based on radiologically affected knee joints of osteoarthritis (N = 32).

Diagnosis of osteoarthritis	N	%
Right	6	18.9
Left	4	12.5
Bilateral	22	68.8
Total	32	100

Table 4. Distribution of Research Respondents Based on the WOMAC Score (N = 32)

WOMAC Score	N	%
Light	19	59.4
Moderate	12	37.5
Weight	1	3.1
Total	32	100

Table 5. Distribution of Research Respondents Based on Radiological Severity of OA (N = 32)

OA severity	N	%
Doubt	6	18.8
Minimum	11	34.4
Moderate	14	43.8
Weight	1	3.1
Total	32	100.0

4. Discussion

From the results of the study on 32 knee OA patients at the RSMH Medical Rehabilitation Installation, it was found that most knee OA patients were in the age group ≥61 years (56.3%). This is in accordance with research conducted by Duybu Cubukcu who said that the risk of developing OA will increase with age[14].

Along with the aging process there will be changes in cartilage morphology due to a decrease in the ability of chondrocytes to maintain and repair tissue. Chondrocytes will experience a decrease in mitotic activity and synthesis, as indicated by a decreased response to anabolic growth factors and synthesize proteoglycans in smaller and non-uniform sizes and synthesize functional proteins in smaller amounts[15]. Of the 32 research respondents, 23 were female respondents (71.9%). This shows that osteoarthritis occurs more in women than men.

These results are consistent with research conducted by Sowers et al. and Cho et al. which says that knee OA occurs more in women than men. This is presumably due to the influence of genetics, lifestyle, differences in hormonal status, and imbalances in bone formation and breakdown between men and women. However, the exact cause of this is still unknown[16]. Most of the knee OA patients had OA in both knee joints (68.8%). Only 18.9% of patients had OA in the right knee joint and 12.5% of patients had OA in the left knee joint. These results are consistent with research conducted by Ahmad, Rahmawati and Wardhana[17]. In this study, it was found that there were more bilateral genu OA patients than unilateral genu OA patients. Bilateral genu OA is usually associated with excess body weight. Excess weight increases the load on both knee joints which can cause cartilage damage in both joints. Meanwhile, unilateral genu OA is more common due to trauma to one knee joint[18].

The radiological correlation test for the severity of OA genu with functional disabilities assessed using the WOMAC score has no significant correlation[19]. The existence of functional limitations in patients with OA genu is not only influenced by the radiological severity of osteoarthritis. This is consistent with research conducted by Unver et al. and Cubukcu, Sarsan and Alkan who stated that radiological severity of OA genu had no significant correlation with functional disabilities of OA genu sufferers[20].

The complaint that most affects functional disability in people with OA genu is pain complaints. The pain experienced by OA sufferers is not always in line with radiological results. There are many factors that can affect the pain experienced by OA sufferers, one of which is the patient's mental status. Patients with depressive mental status have a great sensitivity to the pain they feel, so that they will interpret the pain they feel as severe pain even though the radiology results show that their OA is in a mild degree [21,22,23].

Obesity is one of the conditions that can affect the intensity of the pain complaints felt by OA sufferers. According to Kertia, being overweight has a positive correlation with the severity of pain that people with OA feel. Obesity is directly related to increased mechanical loading on the knee and hip which can cause joint cartilage damage. OA patients who are obese tend to experience more pain than people with OA who are not obese[24,25].

Comorbid diseases such as hypertension can also worsen the pain complaints felt by OA sufferers. Hypertension is a blood vessel disorder that can affect complaints of OA. In hypertension, the blood vessels can constrict over time. This can cause vascularity to the joint area to be disturbed so that the supply of nutrients to the area will also decrease. This situation can cause the clinical complaints felt by OA sufferers to get worse and interfere with their functionality[26,27,28].

Pain in OA is a chronic condition. Chronic pain that occurs in people with OA is fluctuating and can occur acute exacerbations. The complaints felt by OA sufferers will sometimes feel mild and do not cause impairment of their functionality, but at times these complaints can exacerbate them so that they will interfere with the functionality of OA sufferers[29,30]. Acute exacerbations can occur at any severity of OA. In this study, the causes that can lead to fluctuations in perceived complaints are not fully understood[31].

Although several studies found no significant correlation between the severity of radiological OA genu and functional disability, this is different from the study conducted by Gudbergsen et al[32]. In this study, it was said that there was a significant correlation between the severity of genu OA and functional disabilities. This difference may occur because the study conducted by Gudbergsen et al.[33] used a large number of samples and the sample selection was very strict. Complete control of BMI, other systemic diseases, use of analgesics and corticosteroids in respondents who will participate in the study.

Limitations This study did not evaluate differences in functional disability based on the number of knee joints with OA (unilateral / bilateral knee OA)[34,35].

5. Conclusion

From the results of research on the correlation of the severity of genu osteoarthritis radiologically (Kellgren and Lawrence) with functional disabilities (WOMAC score) at the Hospital Medical Rehabilitation Installation. Mohammad Hoesin Palembang, it can be concluded that:

Of the 32 study respondents, there were 56.3% of respondents in the age group ≥60 years, more women (71.9%) than men (28.1%), and most of the respondents experienced OA on both knees. (68.8%).

From the results of the WOMAC score analysis on 32 respondents, it was found that 37.5% of respondents had moderate WOMAC scores, 29.4% of respondents had mild WOMAC scores, and only 3.1% of study respondents had severe WOMAC scores.

Most of the respondents suffered from moderate degrees of OA (43.8%) followed by OA with minimal degrees (34.4%) and OA with doubtful degrees (18.8%). Only 3.1% of respondents suffered from severe OA.

From the results of the correlation test using Somer's, the value of p = 0.097 (p> 0.05) was obtained. There was no significant correlation between the radiological severity of genu osteoarthritis (Kellgren and Lawrence) and functional disability (WOMAC score).

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