Original Research Article

Severity grade of complaints from X-ray imaging on the elderlies with knee osteoarthritis

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ABSTRACT

Background: This study aimed to investigate the correlation between severity of osteoarthritis with disorder or problem experienced by elder osteoarthritis patients.
Methods: This was a cross-sectional study conducted in the period of October until December 2022 in one of the regions in the capital of Indonesia. Data was collected through knee X-ray examination according to Kellgren-Lawrence (KL) classification and direct interview on the elderlies with knee arthritis by using Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) questionnaire. Data analysis was performed with Spearman rank.
Results: From a total of 102 elderly participants who were diagnosed with knee osteoarthritis, it was found out that on average, as the osteoarthritis grade increased, the pain also increased. The stiffness and functional ability experienced by the participants were not according to the grade of the osteoarthritis. There was a weak correlation between severity with disorder or problem in the elderlies with osteoarthritis (p=0.030, R=0.214). Differences are only found in the severity of pain between grade 2 and grade 4, and in the severity of functional disorder between grade 1 and grade 3.
Conclusions: Complaints of osteoarthritis in the elderlies are not specific for each severity grade.

Keywords: Complaints, Elderly, Osteoarthritis, Severity grade, WOMAC

INTRODUCTION

Osteoarthritis (OA) is one of joint disorders, which is mostly experienced by elderly human being through a degenerative process, which is generally marked with pain, stiffness, and limitation of joint range of motion, that cause limiting physical activity. Degenerated joint structure in OA, which is marked by cartilage tissue damage and imperfect tissue repair response, was triggered by repeated trauma to the joint.[1] This condition is common among the elderlies. However, if it continues, it will become the biggest cause of disability and will reduce the quality of life and productivity of a person, which subsequently will become an economic burden for the society and community services.

Heavy and prolonged stress on the knee joint will speed up the degeneration process and trigger OA at a young age, but it is different from the condition of OA in the elderly. Primary knee OA occurs in the elderly due to wear and tear of cartilage tissue. However, younger individuals may experience secondary knee OA due to excessive use of joint or trauma.[2] Researchers estimate that by 2050 there will be 130 million people worldwide suffering from knee

OA. However, early detection and treatment of knee OA help to reduce its progression and improve quality of the society.[3]

Knee OA is generally diagnosed and assessed by radiography (X-ray), which remains the gold standard for screening of knee OA due to its cost effectiveness, safety, broad accessibility, and speed. According to radiologists, the most prominent pathological image of knee OA that is easily observed is the narrowing of joint space and formation of osteophytes.[4] In addition, deformation of the joint surface, subchondral sclerosis, and cysts are the characteristics of X-rays of osteoarthritis.[5]

The typical clinical picture of OA includes knee pain, decreased range of motion, crepitation, bone pain, knee bone enlargement and instability.[6] Kellgren-Lawrence classified knee OA into 4 grades according to X-ray result, i.e., grade 1 shows narrowing of the joint space, grade 2 has formation of osteophytes in the margins of the joint or tibial bone, grade 3 has shown subchondral sclerosis, and grade 4 where deformation at the tip of the bone can be seen.[7]

Cartilage damage, pathology of subchondral bone, periosteum, synovium, and soft tissues are considered contributing to the pain.[8] grade III and IV of knee OA according to Kellgren-Lawrence classification correlate with a more severe clinical picture.[9] However, the severity of knee OA condition showed in the X-ray image is related to the age instead of the level of pain felt.[10]

Clinical symptoms of acute inflammatory conditions in knee OA may or may not correlate with the severity showed in the X-ray image as this is related to the pain perception of each individual. Adaptation of the body to knee OA in chronic conditions with mild inflammation in grade III and IV in X-ray results becomes uncorrelated. This made it possible that one of the studies concluded that there was no significant correlation between clinical and radiological severity of knee OA.[11] OA is not only a cartilage disease, but it also involves the entire joints and other soft tissues (intraarticular and extraarticular), which eventually leads to joint failure.[12] Severe joint cartilage damage and formation of osteophytes in knee joint in the X-ray image of OA conditions with soft tissues, such as ligament and knee driving muscles, that are still in good condition can be the factor which make the functions of knee joint do not decrease and it does not cause any pain. Therefore, the main objective of this study was to investigate the correlation between severity of osteoarthritis and disorder, or problems experienced by elderly osteoarthritis patients.

METHODS

This cross-sectional study was conducted in east Jakarta, one of the regions in the capital of Indonesia. The study team looked for elderlies aged 60 to 79 years old, who were suspected to have knee osteoarthritis in integrated healthcare centre, and have never undergone any knee surgery as an inclusion. The research conducted in the period of October until December 2022. The population of this study were elderly people suffering from osteoarthritis in East Jakarta. The sample consisted of 102 elderly people taken randomly from clusters of elderly centres in 13 sub-districts, where each cluster consisted of 6-10 elderly people. The suspected elderlies were X-rayed in the Universitas Kristen Indonesia Hospital with genu OA examination on one of the knees which was very painful. Data collection was performed according to the assessment result of the severity grade of osteoarthritis according to Kellgren and Lawrence.

Information regarding complaints of the participants were collected through face-to-face interview by using Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) questionnaire, which has been adapted to the local culture by the researcher.[13] The questionnaire includes questions regarding pain, stiffness, and functional difficulties with a total of 24 questions. Each question will be scored 0 to 4, where 0 = non, 1 = mild, 2 = intermediate, 3 = severe, and 4 = extreme. Spearman rank test was used in SPSS (IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp).

RESULTS

There were a total of 102 elderlies who were suspected to have osteoarthritis through physical examination and anamnesis of the researcher, which was subsequently confirmed by radiography assessment that showed 100% of these patients were indeed having osteoarthritis. Determination of severity grade can be clearly observed in radiography results, i.e., 19 elderlies with grade 1, 50 elderlies with grade 2, 24 elderlies with grade 3, and four with grade 4.

Table 1: Correlation between severity (X-ray) and complaints/problems in elderlies with osteoarthritis.

	Grade	N	Mean rank	P value	R
Pain	1	19	45.63	0.022	0.226
	2	50	46.86		
	3	29	61.62		
	4	4	64.00		
Stiff	1	19	50.68	0.744	
	2	50	50.55		
	3	29	54.60		
	4	4	44.75		
Functional	1	19	38.24	0.020	0.23
	2	50	51.36		
	3	29	60.84		
	4	4	48.50		
Total WOMAC score	1	19	39.55	0.030	0.214
	2	50	51.19		
	3	29	59.69		
	4	4	52.75		

Table 2. Differences between severity (X-ray) and complaints/problems in elderlies with osteoarthritis.

Complaints	Pain (p)	Stiffness (p)	Functional disorder (p)
Grade 1 dan 2	0.811	0.939	0.063
Grade 1 dan 3	0.083	0.601	0.025*
Grade 1 dan 4	0.325	0.845	0.557
Grade 2 dan 3	0.030*	0.569	0.168
Grade 2 dan 4	0.212	0.714	0.962
Grade 3 dan 4	0.936	0.54	0.348

*p<0.05

Spearman rank test showed that there was a correlation between severity and complaints (total WOMAC score) in osteoarthritis patients. Upon review of each WOMAC component, it was found out that not all were related to severity grade. Pain and functional disorder were related to severity grade (p value =0.02 and 0.02, respectively), but it was weak correlation (R=0.21) with positive relation (Table 1). Further analysis was done with Mann Whitney post hoc test to see the differences of complaints on each severity grade. Differences were only shown in the severity of pain between grade 2 and grade 3, and severity of functional disorder between grade 1 and grade 3. There was no relation between severity grade and stiffness (p value =0.744). Clearly shown in Table 2.

DISCUSSION

In this study, it was found that the average pain increases with high grade, and so does functional ability, the higher the severity grade, the more impaired the functional ability. More specifically, reported that OA conditions will be likely to experience pain if radiological changes are seen in the tibiofemoral and patellofemoral compartments. They also found that subchondral sclerosis was associated with pain rather than global assessment as in Kellgren-Lawrence.[14]

Given the lack of blood vessels and innervation, cartilage itself is not able to produce inflammation or pain, at least in the early stage of the disease, Therefore, the source of pain mainly comes from the changes in the non-cartilage components of the joint, such as the joint capsule, synovium, subchondral bone, ligaments, and periarticular muscles.[15] As the disease progresses, this structure becomes affected and changes which include bone remodeling, osteophytes formation, weakening of periarticular muscles, weakness of ligaments, and synovial effusion can become the evidence.

This study found that the stiffness felt by the participants was not according to the grade, because it was showed that grade 3 has a high average of stiffness compared to the grade 1, 2 and grade 4. Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) consists of three subscales, i.e., pain, stiffness, and functional. This questionnaire gives global picture

regarding the symptoms caused by knee OA and its impact to physical activities.

The result of this study shows that there is a correlation between severity grade and complaints (total WOMAC score) in patients with osteoarthritis. The correlation was weak (R=0.02) another study shown the correlation is a strong relationship between radiological severity grade of knee OA and the frequency of knee pain.[15,16] This correlation is explainable by pathological changes that affect synovial tissues or subchondral bones or both, which might have important roles in pain and functional disorder related to clinical improvement of OA.[17]

Another study concluded that there is no correlation between pain and functional score, patient factor, and radiological severity grade in knee OA condition18. When we look into the cartilage damage of knee joints with radiological OA grade, a relevant study reported that there is a moderate correlation between radiological joint space narrowing and loss of articular cartilage.[19] It becomes more interesting to see the study result that a large number of subjects with KL grade 4 OA did not experience any pain.[20]

A recent report showed that 25.8% of Dutch subjects with KL grade 3 to 4 also did not show any symptoms, which is consistent with the result of our study.[19] Another study found that patients with higher grade of knee OA in the radiological image suffer from a more severe clinical picture, and the respective result is in contrast to our study result.[17] The discrepancy between knee pain and knee radiographic findings is more pronounced in mild degree OA cases. However, irregularities were also reported in Kellgren-Lawrence (KL) grade 3 or 4, with 25.8% of the subjects did not experience any pain in the knee.[19]

Patients with higher Kellgren-Lawrence score (grade 3 and 4) were significantly older with much higher body mass index (BMI) and longer duration of the disease compared to the patients with lower score (grade 1 and 2)20. The result of another study showed that 5.9% to 31% of subjects with KL grade 4 OA in radiographic assessment from three different study populations did not experience any knee pain.[16]

In terms of developing an intervention program for knee OA conditions, it should be based on clinical and radiological considerations and understanding the relationship. Despite the radiographic changes, knee pain has been reported as an important determinant of physical disability in knee OA.[20,21] Pain becomes a factor in the decrease of physical activity and if it lasts for a long time, it will result in decreased function of ligaments, joint capsule, synovium changes, decreased muscle strength and stability of knee joints, which eventually will lead to disability. Decreased physical activity due to disability will reduce the quality of life of the elderly. It can be concluded that long duration of OA will worsen the knee

OA conditions from both the clinical and radiological aspects, and hence, it will affect the quality of life. A significant relation between the grade of knee osteoarthritis and quality of life of the patients in general, but it was not significant based on gender.[22] In chronic phase, knee OA is more likely to show stiffness in knee motion rather than pain.

Limitations of the study is that the sample of the research was not describing the most severe of osteoarthritis knee, which is grade 4.

CONCLUSION

Based on the radiographic result of elderlies who had osteoarthritis, there is a very weak but positive correlation between complaints/problems and Kellgren-Lawrence (KL) severity grade. Differences were clearly shown on the severity of pain between grade 2 and grade 3, and severity of functional disorder between grade 1 and grade 3. On the other hand, there was no correlation between severity grade and stiffness. Therefore, in general, no complaints/problems due to osteoarthritis that are specific to each severity grade.

ACKNOWLEDGEMENTS

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