

## THE CORRELATION OF BODY MASS INDEX AND AGE WITH DISABILITY RATE IN PATIENTS WITH GRADE II-IV KNEE OSTEOARTHRITIS ACCORDING TO KELLGREN-LAWRENCE AT RS PHC SURABAYA

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### ABSTRACT

**Introduction:** Knee osteoarthritis is a degenerative joint disease that is most common in adults and the elderly in many countries. Incidence of osteoarthritis is increased steadily over the last 15 years. Currently, there is still no simple therapy to cure osteoarthritis disease. Therefore, it is very important to find the risk factor of osteoarthritis to do etiology prevention.

**Aim:** The purpose of this study is to discover the correlation of body mass index and age with disability rate in patients with Grade II-IV Knee Osteoarthritis.

**Methods:** This research is an observational analytical study using cross sectional approach. The sampling techniques used was purposive sampling. Data collection was done by interviewing respondents using KOOS-PS questionnaire.

**Result:** There is a significant, strong correlation between body mass index and disability rate in patients with knee joint OA ( $r=0.661$ ). However, there is no significant correlation between age and knee joint OA disability ( $r=0.150$ ). A moderate correlation is found, respectively, between body mass index and the grade of knee joint OA ( $r=0.424$ ) and also between age and the grade of knee joint OA ( $r=0.352$ ).

**Conclusion:** There is a significant correlation between body mass index and disability rate of patients with knee joint OA.

**Keywords:** Osteoarthritis, Knee osteoarthritis, Body mass index, BMI, Age, Osteoarthritis grade, Kellgren-Lawrence, Disability rate.

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## INTRODUCTION

Osteoarthritis (OA) is a chronic disease of synovial joints which is an injury consisting of progressive softening and disintegration of articular cartilage accompanied by new cartilage and bone growth in the joint (osteophytes).<sup>(1)</sup> OA is the most common cause of disability in adults. The Global Burden of Disease Study reported that the burden of musculoskeletal disorders is far greater than predicted in previous assessments and accounts for 6.8% of worldwide Disability-Adjusted Life Year (DALY).<sup>(2)</sup> In Indonesia, OA prevalence reaches 5% at age <40 years, 30% at age 40-60 years, and 65% at age > 61 years. OA of the knee joint has a high prevalence of 15.5% in men and 12.7% in women.<sup>(3)</sup>

The main symptoms of osteoarthritis include pain, stiffness and limited movement. The development of the disease is usually slow but ultimately can cause joint function failure, pain, and disability.<sup>(4)</sup> Some of the most well recognized standards for clinical diagnosis of OA are the criteria of the American College of Rheumatology (ACR).<sup>(4)</sup> Many attempts have been made to identify and grade OA based on radiologic imaging and most are assessed using the Kellgren-Lawrence (K&L) score. The overall value of severity is determined from 0 to 4. The scoring encompasses assessment for osteophytes, loss of joint space, sclerosis, and cysts. WHO adopts these criteria as a standard for epidemiological studies on OA.<sup>(4)</sup>

The burden of OA is physical, psychological and socioeconomic. It can be associated with significant disability, such as a reduction in mobility and activities of daily living. Psychological

sequels include distress, devalued self-worth, and loneliness. Given the high prevalence of OA in the population, its economic burden is considerable.<sup>(4)</sup> There are epidemiological studies that reveal endogenous and exogenous factors of knee OA. Endogenous factors include age, gender, genetics, ethnicity, and changes in post menopause phase while exogenous factors include macrotrauma, repetitive microtrauma, overweight, resective joint surgery, and lifestyle factors such as alcohol consumption and smoking.<sup>(5)</sup> Knee osteoarthritis also have significant impacts on the lives of sufferers such as reduced mobility and daily activities.<sup>(4)</sup> Therefore, the researcher wanted to find out the relationship between body mass index (BMI) and age with disability rate in patients with grade II-IV knee OA according to Kellgren-Lawrence using Knee Injury and Osteoarthritis Outcome Score Physical-Function Shortform (KOOS-PS) measurement.

## METHODS

This study is an analytical study using cross sectional design with a sample of 74 people. The sample in this study were patients with grade II-IV knee OA joint according to Kellgren-Lawrence criteria in PHC Hospital Surabaya for the period of July 2017. The inclusion criteria of this study were respondents with grade II-IV knee OA patients age  $\geq$ 46 years old and willing to take part in this study by signing an informed consent. The exclusion criteria of this study were patients with post-traumatic osteoarthritis, patients with OA knee joints who had received a Total Knee Replacement, and patients diagnosed with a disease that might disrupt the patient's daily mobility

and activities such as stroke and polyneuropathy.

The measuring instruments used in this study to measure BMI are the body weight scale and stadiometer which are available at the Surabaya PHC Hospital. The knee OA diagnosis encompasses an assessment of clinical symptoms and knee x-ray images based on Kellgren-Lawrence criteria. The diagnosis was done by Radiology Specialist and have been recorded on medical record data. The measuring instrument used to determine the level of disability in knee OA is the KOOS-PS questionnaire. Both independent and dependent variables are of ordinal scale, thus the statistical analysis chosen was non-parametric test. The correlation test is carried out using Spearman test.

The study was conducted on July 14 - July 19, 2017 in the medical rehabilitation department at PHC Hospital Surabaya from 08.00 to 15.00 local time. This data was collected by interviewing the respondents who met the inclusion criteria. The respondents then underwent physical measurements including body height, body weight, and body mass index (BMI). The data was then combined with the respondent's medical record to determine the grade of osteoarthritis.

## RESULT

Table 1 explain that the elderly with the age above 75 years old (*Old*) constitute the majority of all subject in this study, that is equal of 12 people (70,6%). Elderly woman dominates the total number of research subjects, equal to 12 people (70.6%).

**Table 1.** Sample Distribution by Body Mass Index

Body Mass Index	Frequency	Percentage (%)
Underweight	3	4.1
Normal	23	31.1
Overweight	18	24.3
Obese	30	40.5
Total	74	100.0

Table 1 shows that 40.5% of the samples were obese, 22.2% of the samples were overweight, 31.1% of the samples were normal body mass index, and 4.1% of the samples were underweight. Based on these data, showed that obese patients were the most respondents in this study.

**Table 2.** Sample Distribution by Sex

Sex	Frequency	Percentage (%)
Women	67	90.5
Men	7	9.5
Total	74	100.0

From Table 2 shows that 90.5% of the samples were women and 9.5% were men.

**Table 3.** Sample Distributin by Age

Age	Frequency	Percentage (%)
55-59 Years Old	15	20.3
60-64 Years Old	28	37.8
≥ 65 Years Old	31	41.9
Total	74	100.0

Table3 shows that 41.9% samples were ≥ 65 Years Old, 37.8% samples were 60-64 Years Old, and 20.3% samples were 55-59 Years Old.

**Tabel 4.** Sample Distribution by Knee Osteoarthritis Grade

Knee OA Grade	Frequency	Percentage (%)
Grade II	26	35.1
Grade III	29	39.2
Grade IV	19	25.7
Total	74	100.0

From table 4, it was found that 35.1% of the samples experienced grade II OA, 39.1% of the samples had grade III OA, and 25.37% of the samples had degree IV OA.

## DISCUSSION

The majority of the knee joint osteoarthritis patients in the study group were in the age group ≥ 65 years which

reached 41.9% of the total study sample. In this study it was also dominated by 90.5% women subjects, this is because women more often suffer from knee joint osteoarthritis when compared to men, besides that, the knee joint affected by osteoarthritis in women usually has a more advanced stage compared to men.

Anatomical differences such as joint cartilage volume and mechanical factors such as joint shear in the anterior and posterior direction, and greater extension and valgus moments. In addition, hormonal factors in postmenopausal women have a higher risk of developing osteoarthritis due to a lack of estrogen.<sup>(6)</sup>

From the results of the analysis of the correlation between body mass index and disability in osteoarthritis of the knee joint, there is a significant correlation between body mass index and disability knee joint OA and there is a strong correlation that is 0.659. This proves that disability in OA of the knee joint will increase with the increase in a person's body mass index and in accordance with research conducted by Fowler-Brown who found that 5 kg / m<sup>2</sup> increase in a person's body mass index was associated with 32% increase in the probability of OA.<sup>(7)</sup> Therefore, obesity is associated with poor scores on physical activity, low quality of life, and a higher risk of disability in the next 6 years.<sup>(8,9)</sup> This is consistent with research conducted in Canada which states that over the next two decades osteoarthritis will remain a burden for Canadian society, due to the increasing epidemiology of obesity.<sup>(10)</sup>

From the analysis of the correlation between age and disability in OA of the knee joint, there was no significant correlation between age with knee joint

OA disability and a weak correlation of 0.191. This is because many respondents who are younger but have more body mass index than the older respondents, there are also factors such as genetics that cannot be examined in this study, metabolic diseases such as diabetes, and respondent anatomical abnormalities and occupations that adds burden at the knee joint.<sup>(11)</sup>

From the analysis of the correlation of body mass index with the knee joint OA grade, there is a significant correlation between body mass index and grade of the knee joint OA and there is a moderate correlation of 0.424. Respondents who experienced grade II osteoarthritis (OA) mostly had normal BMI, and grade III and IV osteoarthritis (OA) mostly experienced by obese Respondents. In addition, the underweight and normal BMI Respondent were still in the second degree. But many obese respondents have experienced grade III or IV. This is in accordance with a meta-analysis conducted in China which states that osteoarthritis of the knee joint will increase gradually in accordance with the increase in body mass index, and prevention can be done by controlling body weight.<sup>(12)</sup>

From the analysis of the correlation of age to the knee joint osteoarthritis grade, there is a significant correlation between age with the knee joint osteoarthritis grade, and there is a moderate correlation of 0.352. This is in accordance with the results of the research submitted by the National Health Interview Survey-US.<sup>(11)</sup>

The researcher realized that there were still many limitations in this study for this study measured body mass index when taking data, allowing a bias in body mass index. This research also had a limited funding, so researchers could not study the

other factors of osteoarthritis such as genetic factors and congenital anatomical abnormalities.

## CONCLUSION

The result of this study can be summarized as follow:

1. Osteoarthritis is more common in women than in men.
2. There is a significant correlation between body mass index and disability of knee joint OA and there is a strong correlation that is 0.661.
3. There is no significant correlation between age with knee joint OA disability and there is a weak correlation 0.150.
4. There is a significant relationship between body mass index with a grade of knee joint OA and moderate correlation 0.424.
5. There was a significant association between age and grade of knee joint OA and moderate correlation 0.352.

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