



Correlation of Body Mass Index and Kellgren-Lawrence

Degrees in Genu Osteoarthritis

Vien Hardiyanti¹, Mariane Devi¹, I Made Buddy Setiawan², Herman PL Wungou³

¹Siloam Hospital Kupang

²Department of Orthopedics, Siloam Hospital Kupang

³Department of Radiology, Siloam Hospital Kupang

ABSTRACT

Background: Obesity is a major risk factor for osteoarthritis. **Objectives:** The aim of this study is to determine the correlation between body mass index with Kellgren-Lawrence degree in genu osteoarthritis patients. **Methods:** This study used cross-sectional design on 97 participants diagnosed with genu osteoarthritis in Siloam Hospital Kupang in the period January-December 2017. Measurement of height and weight was carried out for the calculation of Body Mass Index. Kellgren-Lawrence degrees were obtained with x-ray photos. **Results:** Most patients were women (69 patients, 71.7%), 50-59 years old (34 patients, 35.1%), with obesity (61 patients, 62.9%). **Conclusion:** There was a significant correlation between BMI and Kellgren-Lawrence degree in genu osteoarthritis ($p = 0.000$).

Keywords: BMI, Kellgren-Lawrence, obesity, osteoarthritis genu

ABSTRAK

Latar Belakang: Obesitas merupakan faktor risiko terjadinya osteoarthritis pada lutut. **Tujuan:** Tujuan dari penelitian ini adalah untuk menentukan korelasi indeks massa tubuh (IMT) dengan derajat Kellgren-Lawrence pada pasien penderita osteoarthritis genu. **Metode:** Penelitian ini menggunakan metode cross-sectional yang dilakukan pada 97 responden yang didiagnosis dengan osteoarthritis lutut di Rumah Sakit Siloam Kupang pada periode Januari-Desember 2017. Derajat Kellgren-Lawrence ditentukan berdasarkan foto x-ray konvensional. **Hasil:** Penderita osteoarthritis terbanyak adalah perempuan (69 pasien, 71,7%), berusia antara 50-59 tahun (34 pasien, 35,1%), dan dengan IMT kategori obesitas (61 pasien, 62,9%). **Kesimpulan:** Terdapat korelasi signifikan antara IMT dan derajat Kellgren-Lawrence pada penderita osteoarthritis genu. ($p = 0,000$).

Kata kunci: IMT, Kellgren-Lawrence, obesitas, osteoarthritis genu

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INTRODUCTION

Osteoarthritis is one of ten diseases that cause disability in developed countries; half of the world's population aged 65 years or more experience osteoarthritis.^[1] Globally, osteoarthritis is experienced by around 240 million of the world's population. It is estimated that 9.6% of men and 18% of women over 60 years experience symptomatic osteoarthritis.^[2] Most cases are in Northern Europe and Russia with a ratio of more than 400 of 100,000 populations. While in

Asia, mostly are in South Asia with a ratio of 320-340 in 100,000 populations.^[3] The prevalence of osteoarthritis in Indonesia reaches 8.1% of the total population; 80% will experience limited movement, and 25% cannot carry out their daily activities.^[4,5] The prevalence of genu osteoarthritis reaches 15.5% in men and 12.7% in women.^[5,6] There have been no studies and definitive data on the incidence of osteoarthritis in East Nusa Tenggara (NTT), even more in Kupang.

Corresponding author: Vien Hardiyanti

Corresponding author at: Jl. Papera No.2216 AB, Palembang, Indonesia

Contact: vienhardiyanti@gmail.com

Increased BMI is associated with increased compression and joint pressure when walking.^[7] BMI in both sexes is also associated with an increased incidence of osteoarthritis.^[8] A meta-analysis study showed that BMI increase of 5 kg/m² was associated with 35% increased risk of developing genu osteoarthritis.^[9] Research in Indonesia showed a significant relationship between body mass index with degree of joint damage in genu osteoarthritis patients.^[10]

This research was to find a correlation between BMI and Lawrence Kellgren degrees in genu osteoarthritis based on conventional x-ray radiographs in Siloam Hospital Kupang.

METHODS

A cross-sectional analytical study conducted at Orthopedic Department of Siloam Hospital Kupang in June 2018. The population was 97 subjects diagnosed with bilateral or unilateral genu osteoarthritis based on history, physical examination, and X-ray photos in Siloam Hospital Kupang from 1 January to 31 December 2017. The inclusion criteria were all patients who had been medically diagnosed with genu osteoarthritis based on medical records. Patients with incomplete medical records, osteoarthritis other than knee osteoarthritis, osteoarthritis with history of knee injury, patients with no radiographic evidence, and patients with walking disorders (including stroke, central nervous system disease, and history of head trauma) were excluded.

Measurement of height and weight is carried out with digital scales and stadiometers. Body mass index was obtained by Quetelet index (weight in kilograms divided by the square of height in meters (kg/m²)) and classified based on the Asia-Pacific criteria: Underweight if the BMI <18.5 kg/m²; Normal if BMI = 18.5-22.9 kg/m²; Overweight if BMI

= 23-24.9 kg/m²; Obese if BMI ≥25 kg/m².^[11]

Radiological classification is according to Kellgren-Lawrence (KL) grading: KL 1 - no definite narrowing of the joint gap and possibility of osteophytes; KL 2 - osteophytes and possible narrowing of the joint gap; KL 3 - multiple osteophytes, narrowing of the joint gap and some sclerosis and possible end-bone deformity; KL 4 - large osteophytes, narrowing of the joint gap, severe sclerosis, and have end-bone deformities.^[12] X-ray photos were made with a General Electric X-ray machine.

Data related to gender, age, location of osteoarthritis, and comorbidities were taken from the medical records of Siloam Kupang Hospital. Data were processed with univariate and bivariate analysis using the SPSS program.

RESULTS

Table 1. Characteristic of Sample

	N		%
Sex			
Male	28		28.9
Female	69		71.1
Age (years)	Male	Female	
<40	0	1	1.0
40-49	2	9	11.3
50-59	8	26	35.1
60-69	10	20	30.9
70-79	7	12	19.6
>80	1	1	2.1
BMI (kg/m²)	Male	Female	
Normal	7	11	18.6
Overweight	5	13	18.6
Obese	16	45	62.9
KL grading scale	Male	Female	
KL1	2	6	8.2
KL2	9	19	28.9
KL3	11	31	43.3
KL4	6	13	19.6
Location of OA	Male	Female	
genu			
Dextra	6	22	28.9
Sinistra	7	14	21.6
Bilateral	15	48	49.5

Abbreviations: KL, Kellgren Lawrence; BMI, Body Mass Index; OA, Osteoarthritis

This study was on 97 participants, 69 were female (71.1%), mostly 50-59 years old (34 patients; 35.1%). Most participants have KL3 degree (42-43.3%). Only 8 people (8.2%) were in KL 1 degree (Table 1).

Participants with normal BMI mostly experiencing KL 2 degree (8.2%) as seen in Table 2, participants with overweight were majority had KL 2 degree (9.3%),

and participants with obesity majority had KL 3 degree (30.9%). Somers'd was run to determine the association BMI and degree of joint damage in osteoarthritis amongst 97 participants. There was a moderate, positive correlation between BMI and degree of joint damage, which was statistically significant. ($r=0.435$, p value=0.0000) (Table 2)

Table 2. Relationship Between BMI and Kellgren Lawrence Grading Scale of Osteoarthritis of Knee

BMI	Kellgren Lawrence Grading, n (%)				Total	<i>r</i>	<i>p</i>
	KL1	KL2	KL3	KL4			
Normal	5	8	5	0	18	0.435	0.000
	5.2%	8.2%	5.2%	.0%	18.6%		
Overweight	1	9	7	1	18	0.435	0.000
	1.0%	9.3%	7.2%	1.0%	18.6%		
Obese	2	11	30	18	61	0.435	0.000
	2.1%	11.3%	30.9%	18.6%	62.9%		
Total	8	28	42	19	97	0.435	0.000
	8.2%	28.9%	43.3%	19.6%	100.0%		

Abbreviations: KL, Kellgren Lawrence; BMI, Body Mass Index

DISCUSSION

The majority of male participants experienced a 3rd degree Kellgren-Lawrence osteoarthritis damage (11.3%), while the majority of female participants experienced a 3rd degree KL (32%) (Table 1). Similar to the prevalence of osteoarthritis based on radiological examination of the knee joint in Indonesia, which has a prevalence rate of 5% in men and 12.7% in women.^[6] A study in Lampung found radiological prevalence of osteoarthritis genu, 15.5% in men and 12.7% in women.^[13] This can be caused by differences in place, pattern of participant activity, and other external factors.^[13]

In this study, 50-59 years age group is the largest group with 3rd degree KL classification (15.5%) (Table 1). This study proves that as they get older, the greater the prevalence of osteoarthritis (Table 1). A previous study in Nottingham area found 70% of patients over 65 years of age suffered from osteoarthritis based on radiological findings.^[14] The prevalence

of genu osteoarthritis in female aged 75 years and over can reach 35%.^[15] In Padang, genu osteoarthritis were mostly found in people aged fifty (22 patients, 91.7%).^[10]

There was a relationship with moderate/moderate relationship between BMI with degree of joint damage based on Kellgren-Lawrence as seen in Table 2. The prevalence of osteoarthritis also increases in patients with metabolic diseases (hypertension, hypercholesterolemia, and blood glucose) and genu osteoarthritis in women, especially in obese women.^[15-16] Genu osteoarthritis is more common in obese participants compared to non-obese participants in the elderlies in Laweyan Surakarta.^[5] A significant correlation between Body Mass Index and the degree of joint damage in genu osteoarthritis was also found in West Sumatra; 88.9% of obese patients had a heavier degree of osteoarthritis.^[10] A meta-analysis study showed 35% increased risk of developing genu

osteoarthritis with 5 kg/m² increase in BMI.^[9] Framingham study shows that weight loss can reduce the risk of osteoarthritis in women; a weight loss of 5.1 kg over 10 years reduced the incidence of symptomatic genu osteoarthritis up to 50%. Weight reduction is associated with a significant reduced risk of osteoarthritis in individuals with high BMI (BMI ≥ 25 kg/m²), but not with a BMI < 25 kg/m².^[17] Reyes showed that, compared to subjects with normal weight, being overweight or obese increased the risk of OA at all 3 joint sites, especially at the knee. A status of overweight, grade I obesity, and grade II obesity increased the risk of knee OA by a factor of 2-fold, 3.1-fold, and 4.7-fold, respectively.^[18]

CONCLUSION

There was a significant correlation between BMI and Kellgren-Lawrence degree in osteoarthritis genu patients at Siloam Hospital Kupang.

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