

Hubungan indeks massa tubuh dengan kejadian osteoarthritis lutut di Rumah Sakit Umum Zainoel Abidin Kota Banda Aceh

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Abstrak. Indeks Massa Tubuh (IMT) merupakan parameter yang digunakan untuk menilai komposisi tubuh dengan menggunakan klasifikasi Asia Pasifik. IMT menjadi salah satu faktor risiko terjadinya osteoarthritis lutut. Osteoarthritis lutut merupakan penyakit degeneratif yang terjadi pada sendi lutut. Berdasarkan RISKESDAS tahun 2018, Provinsi Aceh menduduki peringkat pertama sebagai provinsi dengan angka penyakit sendi terbanyak yang termasuk osteoarthritis lutut yaitu 13.3%. Prevalensi indeks massa tubuh berlebih di Indonesia pada tahun 2018 meningkat dari 26.3% menjadi 34.4% sehingga kemungkinan terjadinya osteoarthritis lutut juga meningkat. Penelitian ini menggunakan metode observasional analitik dengan desain *cross-sectional* dilakukan dengan cara mengukur berat badan dan tinggi badan responden yang memenuhi kriteria penelitian berdasarkan pedoman *American College of Rheumatology* (ACR). Sampel dikumpulkan berdasarkan rekam medis di Rumah Sakit Umum Zainoel Abidin kota Banda Aceh sejak september hingga oktober 2019 yang melibatkan tujuh puluh responden sebagai sampel penelitian yang dimana 51 responden (72.9%) memiliki indeks massa tubuh berlebih dan 43 responden (61.4%) didiagnosis dengan Osteoarthritis lutut. Berdasarkan hasil analisis uji *Chi Square*, nilai *p value* yang diperoleh adalah 0.021 ($p \text{ value} \leq 0,05$). Dengan demikian, penelitian ini menunjukkan bahwa terdapat hubungan antara indeks massa tubuh dengan kejadian osteoarthritis lutut di Rumah Sakit Umum Zainoel Abidin di kota Banda Aceh.

Kata Kunci: Indeks massa tubuh; berat badan lebih, osteoarthritis lutut;

Abstract. Body Mass Index (BMI) is a parameter to measure body composition which is classified into underweight, normal and overweight. Overweight has been known to potentially cause knee osteoarthritis. Knee osteoarthritis is a degenerative disease happening on the knee. Based on RISKESDAS 2018, Aceh led Indonesia as a province with the highest number of knee arthritis (13.3%). In the same year, the prevalence of overweight in Indonesia has also increased from 26.3% to 34.4% and is expected to rise annually. This research is an analytic observational using cross sectional design. The method used in this research is body weight and body length measurement of samples fulfilling the criteria based on American College of Rheumatology (ACR). Data were collected based on medical record at Zainoel Abidin General Hospital, Banda Aceh, from September to October 2019. We examined 70 respondents, 51 of them (72.9%) had overweight IMT and 43 of them (61.4%) were diagnosed with knee osteoarthritis. Chi Square analysis showed *p value* 0,021 ($p \text{ value} \leq 0.05$). We concluded that there is a correlation between body mass index with knee osteoarthritis in Zainoel Abidin General Hospital, Banda Aceh.

Keyword: Body Mass Index; overweight; knee osteoarthritis;

Introduction

Osteoarthritis (OA) is a slow progressive chronic disorder of the joint movement caused by cell stress and degradation of the extracellular matrix. The characteristics include massive erosion of joint cartilage and the existence of osteophytes or the formation of new bone on the joints.^[1] Osteoarthritis frequently affects weight-bearing areas such as knee and hip joints.²

Data on Global Burden of Disease in 2019 showed that knee and hip OA were ranked as the 11th cause of global disability.^[3] In the United States, there were more than 30 million people are diagnosed with OA which leads the cause of job dismissal.^[4] Osteoarthritis is a form of joint inflammation accounting for 15% of the

population. This disease is a major cause of disability of the lower extremities in the elderly with the estimated risk of lifetime disability of around 40% in men and 47% in women.⁵

According to the Centers for Disease Control and Prevention (CDC) in 2019, work limitations due to OA are very common in working age populations (18-64 years). There is 1 of 3 working age adults had osteoarthritis in the country with the lowest prevalence of OA. Whilst half of working age in countries with the highest prevalence adults suffered OA.⁶

Based on Basic Health Research (RISKESDAS 2018) data, the mean prevalence of joint disorder including OA in Indonesia was 7.3%. Aceh was

mentioned as a province with highest prevalence (13.3%) contrasting to West Sumatra as the province with the lowest prevalence of OA (3.2%). Most cases were diagnosis at the age of ≥ 75 years (18.9%). Urban population had lower prevalence (6.9%) compared to rural prevalence (7.8%) and men (8.5%) were likely to suffer OA rather than women (6.1%).⁷

Body Mass Index (BMI) is a method to assess body composition classifying into three categories: excessive, inadequate, or normal.^[8] BMI is the easiest approach to diagnose obesity which is one of knee OA risk factors^[9]. According to the Center for Obesity Research and Education, a person is categorized as obese if BMI of 25.0 to 29.9 is detected.^[10] WHO MONICA Study (*Monitoring of determinants in Cardiovascular diseases*) said that 1 of 3 adults were overweight and 1 of 10 adults are obese, globally.¹⁰

A study in Chingford found that obesity can increase the risk of OA as much as four times in men and seven times in women.^[11] It also showed that 88% of patients with grade 3 and 4 OA occurred in people with excessive BMI and 16.7% occurred in people with normal BMI. Furthermore, 83.3% of patients with grade 1 and 2 OA had normal BMI while 11.1% patients had excessive BMI.^[12] These data inferred that the likelihood of knee OA increases in excessive BMI. Syairul also found that there is a correlation between body mass index and knee osteoarthritis which is opposed to a study conducted by Widhianto in 2017.^[13] As the results of this study is still not consistent, we aimed to find out the correlation between body mass index and the incidence of knee osteoarthritis in the Zainoel Abidin General Hospital, Banda Aceh City.

Methods

This is an observational analytic study with cross sectional design. The samples were patients seeking for treatment at Orthopaedic Polyclinic and Internal Medicine Polyclinic at Zainoel Abidin Regional General Hospital, Banda Aceh. The inclusive criteria were at least 3 of 6 symptoms of knee OA based on the American of Rheumatology (ACR) guideline, they are: crepitus during active movement, joint stiffness

less than 30 minutes, 50 years or older, enlargement of knee joints, tenderness at the edges of the bones, and no palpable warm on the synovium of the knee joint. Respondents met the criteria had a height and weight measurement to calculate the body mass index. The diagnosis of knee OA is collected based on medical records. The data was collected between September to October 2019.

Results and discussion

This study involved 70 respondents who have met the inclusion and exclusion criteria. Age and sex distribution is presented in table 1 below.

Table 1. General Characteristics

Characteristics	Frequency (n)	Percentage (%)
Age :		
17-25 years	2	2.9
26-35 years	7	10.0
36-45 years	6	8.6
46-55 years	16	22.9
56-65 years	15	21.4
> 65 years	24	34.3
Gender :		
Male	34	48.6
Female	36	51.4
Total	70	100.0

The results showed that the sample was dominated by respondents aged > 65 years (34.3%) and decreased progressively until the age of 17-26 years (2.9%). This can be explained by anatomical, physiological and biochemical changes in the body affecting systemic function which includes the musculoskeletal system characterized by joint tenderness.^[14] The respondents were also dominated by female (51.4%) rather than male (48.6%). This is consistent with the reduction of female estrogen after the menopause phase.^[15] However, Natya in Indonesia showed a different result in which there was no significant relationship between age and sex on the incidence of knee OA.¹⁶

Table 2. Distribution of Body Mass Index

Characteristics	Frequency (n)	Percentage (%)
Not excessive BMI:		
Underweight	6	8.6
Normal	13	18.6
Excessive:		
Overweight	15	21.43

Obesity type I	21	30.0
Obesity type II	15	21.43
Total	70	100.0

Data on table 4.2 showed that the majority of respondents had excessive BMI (72.9%). Type I obesity dominate the excessive BMI respondents. This was due to the tendency of type I obesity respondents complaining knee osteoarthritis to have normal daily activities which is hardly happened to the respondents of type II obesity.^[17] An increase of BMI is associated with the imbalance of food intake and the number of calories consumed with energy in the form of fat. Other factors including age play an important role in muscle mass and physiological fat accumulation. The prevalence of obesity also increases continuously until the age of 44 years and decreases at the age of 45-54 years¹⁸

According to a study by Asheley in the United States in 2019, the prevalence of obesity increases annually, both type I and type II obesity.^[17] This is also related to dominance of obese respondents which were more than other categories. According to the International Journal of Rheumatic Disease 2016, excessive or obese BMI is a major cause which increases morbidity and mortality both in developed and developing countries.^{[19][20]} Type I obesity and type II obesity are closely related to the risk of cardiovascular disease metabolic diseases.¹⁷

Table 3. Knee Osteoarthritis (OA) Frequency Distribution in General

Characteristics	Frequency	Percentage
	(n)	(%)
OA	43	61.4
No OA	27	38.6
Total	70	100.0

Based on data on table 4.3, it is confirmed that there is a tendency of the respondents to develop OA (61.4%). Symptoms experienced by patients with knee osteoarthritis including tenderness and dysfunction of affected joints as also morning stiffness, deformity, swelling, and crepitus.^{[21][22][23]} Respondents involved in this study had at least 3 criteria for knee OA based on the American College of Rheumatology (ACR).²⁴

A study conducted by Kurniawan in Indonesia in 2016 mentioned that elderly aged more than 60 years have a higher prevalence of knee OA (49%) while the least prevalence was at the age of 50

years (24%).^[25] This is significant with increasing age, changes of the cartilage, progressive loss of articular joint cartilage, subcondral bone thickening, osteophyte growth, ligament damage, and mild inflammation.²⁶

Respondents experiencing OA were dominated by type I obesity category (15 respondents) and the lowest was on underweight category (1 person). The prevalence of obesity is very high in which which is 1 of 3 residents experienced OA. According to the RISKESDAS 2018, the prevalence of obesity and overweight was 21.8% and 13.6%, respectively.^[7] Bailey in the 2016 journal mentioned that excessive or obese BMI is strongly associated with the development of osteoarthritis. This is caused by increased joint reaction force in each knee compartment.²⁷

Table 4. Chi Square Analysis Correlation of Body Mass Index with the Occurrence of Knee Osteoarthritis

BMI	Knee Osteoarthritis				Total	P Value	PR
	Yes		Not				
	n	%	n	%			
Excessive	36	70.59	15	29.41	51	0.021	1,916
Not Excessive	7	36.85	12	63.15	19		

Bivariate analysis using chi square test showed p value of 0.021 (≤ 0.1) which means a significant correlation between body mass index with the incidence of knee osteoarthritis. Based on the frequency, 36 respondents diagnosed with knee OA had an excessive BMI and 7 respondents had a not excessive BMI. The prevalence ratio was 1,916 which means people who have excessive BMI is 1.9 times risky to develop knee OA.

The result is supported with data from CDC which showed that 2 of 3 adults having excessive BMI or obesity can develop symptoms of knee osteoarthritis.^[6] This is caused as weight and increased load will be beared by the knee joint.^{[6][26]} Studies in Chingford also showed that each 5 kgs increase off BMI will increase the odds ratio by 1.36.^[28] Based on research conducted in China, the prevalence of knee osteoarthritis increases with age, in menopausal women and excessive BMI.^[1] Nuttal in the US found out that excessive or obese BMI is one of important risk factors for knee OA and able to increase the severity of knee OA.^{[29][9]} Besides, Endang in Indonesia had different finding in which there is no correlation between body mass index and osteoarthritis seen by radiological examination result.¹²

Different study by Agrasan in Indonesia in 2019 showed that age is possible to determine individual BMI. BMI increases progressively between 20-60 years. This is related to the criteria of respondents commonly having knee OA at age > 65 years.^[30] In addition, a study conducted by Tiara in Indonesia in 2018 showed that knee osteoarthritis mostly occurs in the elderly who are 70 years old, usually occurs in the elderly who are aged 40 years and over and will multiply with increasing age. This is because the body mass index of the elderly is mostly excessive.^[25]

Knee OA in excessive BMI patients is generally caused by prolonged and weightbearing activities.^{[21][31][32]} In excessive BMI, problems in the position of the knee joint that supports the weight of the body is often found which cause medial shift so the burden of the knee joint will be unbalanced. As a result, the knee joint will erode and cause pain.^[24] The results of this study indicate that respondents having excessive BMI are dominated by respondents aged over 40 years which are caused by diet, sports activities, and other factors.^[33] Frequent consumption of fast food can affect BMI. Fraser's mentioned that teenagers consuming fast food and unhealthy foods tend to have excessive BMI.¹⁸

This study concluded that excessive BMI individual should receive special treatment to lose weight in order to reduce the risk of knee OA. Adequate and appropriate physical activity can decrease significant BMI.^[34] Interventions that can be done to relieve pain in the long run for respondents with an excessive BMI including diets, weight loss programs, and exercises.

According to the Western Ontario and McMaster University Arthritis Index, mild-moderate exercise programs and agility training can help the symptoms healing process.^[35] Physical activity is defined as a form of body movement that produce meaningful energy expenditure and is categorized based on mild, moderate, and heavy activity.^[18] Based on research conducted by Widhalm in Austria, strict exercise and diet programs can lose weight by 4.7 kilograms, which is highly recommended.³⁴¹⁸

Conclusion

Based on the analysis and discussion, we concluded that there is a significant correlation between excessive body mass index and the incidence of knee osteoarthritis in Zainoel Abidin Hospital in Banda Aceh City

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