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Relationship between Body Mass Index (BMI) and Knee Osteoarthritis at the UKI General Hospital, Jakarta in 2017

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ABSTRACT

Knee osteoarthritis is a degenerative joint disease usually suffered by elderly patients, contributing to the high risk of disability. The risk factors that affect the severity of knee osteoarthritis are obesity, age, sex, occupation, patient's history of the disease, trauma and other factors. Excessive body weight is a factor that exacerbates the disease of Osteoarthritis. Generally, this research is aimed to examine the correlation between Body Mass Index (BMI) and knee osteoarthritis at UKI General Hospital in 2017. The researcher used a descriptive-analytic study with a cross-sectional approach. In this study, the researcher used 30 samples. The results showed that there was a relationship between BMI and the incidence of knee osteoarthritis. This study indicates that BMI values above average (more than 24.9) can affect the occurrence of joint space narrowing in patients. Patients with abnormal BMI have a risk of 6,429 times the risk of joint space narrowing compared to patients with normal BMI. The mean BMI value of patients with knee osteoarthritis at UKI General Hospital is 25.6. Therefore, the researcher concluded that there is a correlation between BMI and knee osteoarthritis, in which a high BMI value (>24.9) may affect the occurrence of joint space narrowing among the patients. The mean BMI value among the osteoarthritis patients at UKI General Hospital is 25.6, indicating that most osteoarthritis patients are pre-obese/overweight.

Keywords*: Knee osteoarthritis, Body Mass Index (BMI), joint space narrowing*

INTRODUCTION

Osteoarthritis (OA) is a degenerative joint disease associated with joint cartilage damage. Vertebrae, pelvis, knees, and ankles are most commonly affected by OA. Osteoarthritis is the most common articular disease in developed countries and the leading cause of chronic disability, as the most common consequence of knee OA and hips OA. The prevalence of symptomatic knee OA increases with each decade of life, with the highest annual incidence of knee OA between 55 and 64 years [4]. In Indonesia, the prevalence of knee OA is relatively high, namely 15.5% in men and 12.7% in women [5]. Based on medical record data at UKI General Hospital in 2017, 162 patients experienced joint inflammation, of which 106 patients were knee OA sufferers. Joints between bones will work harder when carrying heavy loads and are thought to contribute to OA [1]. Excess body weight is associated with an increased risk for developing OA in both women and men. Excessive body weight is a factor that will aggravate OA disease [2].

Based on the description above, the author wants to research the relationship between Body Mass Index (BMI) and Knee Osteoarthritis at UKI General Hospital. This research is expected to be input for medical workers in seeing the effect of body weight on the incidence of knee osteoarthritis in patients at UKI General Hospital in 2017.

This research is also expected to be input for health workers in educating patients with knee osteoarthritis at UKI General Hospital. Better so that patients can maintain their weight and carry out daily activities better because the knee joint is one of the joints most often used in daily activities. From the background of the problem above, the problem answered in this study is "What is the relationship between Body Mass Index (BMI) in knee osteoarthritis patients at UKI General Hospital in 2017?" With the aim of research to determine the relationship between Body Mass Index (BMI) in patients with knee osteoarthritis at UKI General Hospital in 2017.

LITERATURE REVIEW

Osteoarthritis is a degenerative disease in the joints caused by several factors. This disease has a characteristic in the form of damage to the cartilage (joint cartilage). Cartilage is a complex, slippery tissue that surrounds the ends of hard bones in joints. This tissue functions as a smoothing movement between bones and as a shock absorber when the joint performs an activity or movement [5]. Osteoarthritis (OA) is a degenerative joint disease associated with joint cartilage damage. Vertebrae, pelvis, knees, and ankles are most commonly affected by OA. Osteoarthritis is a degenerative disease due to chronic joint failure and attacks, especially the joint cartilage. The joints affected have a predilection for weight-bearing joints: the neck joints, lumbosacral vertebrae, hips, knees, ankles, and the first metatarsal phalangeal joints, as well as the CMC (Carpometacarpal), PIP (Proximal Interphalangeal) and DIP (Distal Interphalangeal) joints [6].

Osteoarthritis (OA) is the most common articular disease in developed countries and a leading cause of chronic disability, mainly knee OA and hip OA. The prevalence of OA increases with age, up to 80% in people over 65 in high-income countries. As the world's population ages, it is estimated that degenerative joint disease disorders such as OA will affect at least 130 million people worldwide by 2050. At least 15 per cent of all adults over the age of 60 are believed to have this disorder, with women having a higher prevalence of Osteoarthritis higher than men. It is estimated that worldwide, 9.6% of men and 18.0% of women over 60 have OA. Osteoarthritis is considered the most common of all musculoskeletal diseases, affecting about 10% of the world's population over 60. Osteoarthritis ranks fifth among all forms of disability worldwide [7].

Osteoarthritis of the hip and knee is the leading cause of disability worldwide and is responsible for approximately 17 million years of living with disability worldwide. The prevalence of symptomatic knee OA increases with each decade of life, with the highest annual incidence of knee OA between 55 and 64 years of age. The prevalence of symptomatic knee OA has increased over the past few decades in the United States, with an ageing population and a growing obesity epidemic. There are 14 million individuals in the United States who have symptomatic knee OA. In 2010, the symptomatic knee osteoarthritis prevalence in patients aged 45 and older was estimated to be between 5.9 and 13.5% in men and 7.2 and 18.7% in women, respectively. Approximately 10 million adults have symptomatic knee OA. Knee osteoarthritis is often accompanied by comorbidities that contribute to decreased quality of life, namely obesity or overweight (90%), hypertension (40%), depression (30%), diabetes (15%) [8].

Based on the Basic Health Research (*Riskesdas*) in 2007, the prevalence of joint disease nationally was 30.3%, and the prevalence based on the diagnosis of health workers was 14%. By province, the highest prevalence of joint disease was found in West Papua Province (28.8%) and the lowest in West Sulawesi (7.5%). The coverage of joint disease diagnosis by health personnel in each province is generally around 50% of all cases found. The prevalence of the joint disease by gender in

Indonesia tends to be higher in women. The prevalence of knee osteoarthritis in Indonesia reaches 5% at the age <40 years, 30% at the age 40-60 years, and 65% at the age>61 years. In Indonesia, the prevalence of genu osteoarthritis is relatively high, namely 15.5% in men and 12.7% in women [9].

Based on patient data at the UKI General Hospital in 2017, 162 patients experienced joint inflammation. Of the 162 patients, 106 were knee OA patients who came for examination and treatment at UKI General Hospital.

Risk factors for Osteoarthritis include the following: Age-Osteoarthritis usually occurs in elderly people, rarely seen with osteoarthritis patients under 40 years of age. Of all the risk factors for the development of OA, ageing is the strongest. The prevalence and severity of OA increase with age. OA is rarely seen in children, rarely under 40 years of age and often over 60 years [10].

Obesity and Metabolic Disease-Carrying heavier loads will make the joints and bones work harder, thought to contribute to Osteoarthritis.1 Excess body weight is significantly associated with an increased risk of developing OA in women and men. Obesity was associated with OA in the joints that bear the burden and OA of other joints (hand or sternoclavicular). Therefore, in addition to mechanical factors that play a role (due to increased mechanical load), it is suspected that there are other factors (metabolic) that play a role in the emergence of this association. The role of metabolic and hormonal factors in the relationship between OA and obesity is also supported by the association between OA and coronary heart disease, diabetes mellitus, and hypertension. Osteoarthritis patients were found to have a higher risk of coronary heart disease and hypertension than people without Osteoarthritis [11].

Gender-Women are more likely to develop OA of the knee and OA of multiple joints, and men are more likely to develop OA of the thigh, wrist and neck. Overall, under 45 years, the frequency of OA is more or less the same in men and women, but over 50 years (after menopause), the frequency of OA is more in women than men. It suggests a hormonal role in the pathogenesis of OA. Joint, Occupational and Sports Injuries-Strong work and continuous use of a single joint (e.g. carpentry, cotton picking) are associated with an increased risk of certain OA. Likewise, joint injuries and sports that often cause joint injuries are associated with a higher risk of OA. The role of repeated impact loads in the development of OA remains controversial. Certain activities can predispose to OA traumatic injuries (e.g. meniscus tears, ligament instability) that can affect the joint. However, apart from actual injury, research results do not support overuse as a factor for OA development. However, repeated impact loads can be a site-defining factor in persons predisposing to OA and may be related to the development and severity of OA [12].

Genetics - Hereditary factors also play a role in the onset of OA. For example, in the mother of a woman with OA of the distal interphalangeal joints (Heberden's nodes), there are two times more OA in these joints, and her daughters tend to have three times more often than the mothers and daughters of women without such OA. The presence of mutations in the procollagen II gene or other structural genes for articular cartilage elements such as collagen types IX and XII, binding proteins or proteoglycans is said to play a role in the onset of a familial tendency in certain OA (especially multi-joint OA) [13].

Ethnicity-Thigh OA is less common among blacks and Asians than Caucasians. OA is more common in Native Americans (Indians) than white people. It may be related to differences in lifestyle and differences in the frequency of congenital and growth abnormalities.2 Congenital and growth disorders (e.g. Perthes disease and congenital dislocation of the thigh) have been associated with the development of OA of the thigh at a young age. This

mechanism is also thought to play a role in more OA of the thigh in men and particular races [2]. High bone density is said to increase the risk of developing OA. It may arise because the denser (more challenging) bone does not help reduce the impact load received by the joint cartilage. As a result, joint cartilage becomes more prone to tearing [14]. This factor is thought to contribute to higher rates of OA in obese people and runners (who generally have denser bones) and is negatively associated with osteoporosis and OA.

Pathogenesis and Pathophysiology of Osteoarthritis-Based on the pathogenesis of OA are divided into two, namely primary OA and secondary OA. Primary Osteoarthritis is also known as idiopathic OA, OA whose cause is unknown and has nothing to do with systemic disease or local changes in the collaborative process. Secondary OA is OA based on endocrine, inflammatory, metabolic, growth, hereditary disorders, micro and macro injury and prolonged immobilization. Primary Osteoarthritis is more common than secondary OA [15].

The development of Osteoarthritis is divided into three phases, which are as follows [1]: Phase 1: proteolytic breakdown of the cartilage matrix occurs. Chondrocyte metabolism is affected and increases the production of metalloproteinases, which are then destroyed in the cartilage matrix. Chondrocytes also produce protease inhibitors that will affect proteolytic. This condition manifests in the thinning of the cartilage. Phase 2: in this phase, fibrillation and erosion of the cartilage surface occur, accompanied by the release of proteoglycans and collagen fragments into the synovial fluid. Phase 3: the breakdown of cartilage products that induces an inflammatory response in the synovial. Production of synovial macrophages such as interleukin 1 (IL-1), tumour necrosis factor-alpha (TNFα), and metalloproteinases is increased. This condition gives a reverse manifestation of the cartilage and directly affects the destruction of the cartilage. Other pro-inflammatory-inflammatory molecules such as nitric oxide (NO) are also involved. This condition manifests changes in joint architecture and impacts bone growth due to joint stability - changes in joint architecture and inflammatory stress influence the articular surface to become a progressive disorder.

Clinical Manifestations of Osteoarthritis-The clinical presentation of Osteoarthritis depends on the extent to which the impact of Osteoarthritis causes cartilage destruction. Symptoms of Osteoarthritis are progressive, where complaints occur slowly and gradually worsen [16]. Joint Pain-This complaint is the main complaint that often brings patients to the doctor (even though the joint may have been stiff and deformed before). The pain usually increases with movement and decreases slightly with rest. Specific movements sometimes cause more pain than others. Pain in OA can also spread or result from radiculopathy, for example, in cervical or lumbar OA. Lumbar OA that causes spinal stenosis may cause complaints of pain in the calf, commonly referred to as intermittent claudication.

Joint Movement Barriers-This disorder usually gets worse slowly as the pain increases. These changes are often present even in early (radiological) OA. It usually worsens as the disease progresses until the joint can only be moved and becomes contracture. Barriers to motion can be concentric (all directions of movement) or eccentric (one direction of movement only) [2]. Morning Stiffness joint pain or stiffness may occur in some patients after immobilization, such as sitting in a car for a long time or even after waking up.

The crepitus-This symptom is more meaningful for clinical examination of knee OA. At first, it is just a feeling of something being broken or crushed by the patient or the examining doctor. As the disease progresses, crepitus can be heard up to a certain distance. This symptom may arise due to friction of the two joint surfaces

when the joint is moved or passively manipulated [2].

Joint enlargement (deformity) and often asymmetrical swelling of the joints. The patient may show that one of the joints (often seen in the knee or hand) is slowly getting more significant. These changes can arise due to long-standing joint contractures, changes in joint surfaces, various defects and standing styles and changes in bone and joint surfaces [17]. Asymmetric joint swelling due to joint effusion, which is usually minimal (<100cc) and osteophytes [2; 3].

Signs of Inflammation-Signs of inflammation in the joints (tenderness, impaired movement, uniform warmth and redness) may be seen in OA due to synovitis. Usually, these signs are not prominent and appear later, often found in the knees, ankles and small joints of the hands and feet. Changes in Gait- This symptom are a symptom that troubles the patient. Almost all patients with OA of the ankle, heel, knee or hip become disabled. Gait disturbances and other joint dysfunctions pose a significant threat to the generally elderly OA patient. Body Mass Index (BMI) is a measure to indicate nutritional status in adults. It is defined as a person's weight in kilograms divided by the square of that person's height in meters (kg/m2) [18].

$$BMI\ (kg/m^2) = \frac{body\ weight\ (kilograms)}{(Height\ (meter))^2}$$

The following is a classification of BMI according to WHO.

Table 1. WHO Classification of BMI

BMI	Status Nutrisi
< 18.5	*Underweight*
18.5-24.9	Normal
25.0-29.9	*Pre-Obese*
30.0-34.9	*Obesity Class 1*
35.0-39.0	*Obesity Class 2*
> 40	*Obesity Class 3*

BMI ranges are based on the effect of excess body fat on disease and mortality and are moderately related to adiposity. BMI was developed as an indicator of disease risk; as BMI increases, so does the risk of some diseases. Some of the common conditions associated with overweight and obesity include premature death, cardiovascular disease, high blood pressure, Osteoarthritis, some cancers and diabetes [12]. The normal BMI value is between 18.5-24.9, so if a BMI value is obtained outside the range of values, it can be said that a person's BMI value is not normal. Abnormal BMI values can be in the form of being underweight and overweight. Being Underweight can increase the risk of infectious diseases while being overweight will increase the risk of degenerative diseases [19].

The Relationship Between Osteoarthritis and Body Weight-Carrying heavier loads will make the joints work harder, allegedly contributing to osteoarthritis [1]. Excess body weight is significantly associated with an increased risk for developing OA in both women and men. Excessive body weight turns out to be a factor that will aggravate OA disease [2]. The physiological mechanisms responsible for obesity are not fully understood. However, there is growing evidence of several signalling mechanisms in the small intestine, adipose tissue and brain, and possibly other tissues that can provide insight into the flow of nutrient intake, their distribution and metabolism, and storage. All of these mechanisms are coordinated in the brain and lead to changes in diet, physical activity, and body metabolism to maintain energy reserves in the body. The recent discovery of the hormone leptin, which is secreted by adipocytes in proportion to triglyceride stores and binds to receptors in the hypothalamus, provides an exciting picture of possible regulatory signal systems that function to maintain energy balance. However, there is still much to learn more about the system [20].

Being overweight at the age of 36-37 years is a risk factor for knee OA in the elderly. Under normal circumstances, the body's weight will pass through the medial

knee joint and be balanced by the lateral thigh muscles so that the results will fall on the central part of the knee joint. However, in obesity, the resultant will shift medially so that the load received by the knee joint will be unbalanced. It can cause cartilage wear due to shifting of body fulcrum [21].

Research conducted by Heim states that obesity will cause changes in the structure and composition of joint cartilage. The process of cartilage damage will occur and cause abnormal joint cartilage formation and the activation of inflammatory mediators that will damage the knee joint enzymatically [22]. Another theory proposed by Iannone states that obesity can increase the production of pro-inflammatory-inflammatory cytokines such as IL-6, IL-1, IL-8, and TNF-a, which are triggered by adipose tissue. Furthermore, adipose will produce adipokines that trigger synovial inflammation, cartilage degradation, and bone matrix remodelling [23]. Adipose tissue also secretes leptin concluded that leptin is the critical link between obesity and Osteoarthritis. Increased leptin levels will increase pro-inflammatory-inflammatory cytokines' synthesis and cause accelerated cartilage degradation [24].

The results of this study showed there was a relationship between obesity and the incidence of knee osteoarthritis. In obese BMI, patients with obese BMI have a risk of 7.20 times for knee osteoarthritis compared to patients with normal BMI [5]. Another study conducted by Suseno showed that the higher the BMI measurement results, which indicates obesity, the higher the risk. High risk of developing Osteoarthritis and from the results of the analysis also obtained someone who is classified as obese, has a 2.6 times risk of developing Osteoarthritis than those who are not classified as obese [25]. In Aldila's research, it was found that there was a relationship between BMI and knee osteoarthritis. Overweight patients have a 2,5241 times greater chance of experiencing knee osteoarthritis than subjects with normal weight, and subjects with average weight have a 0.462 times greater chance of experiencing knee osteoarthritis than subjects who have a lean body weight [26].

In Mutiwara's study, it was found that patients suffering from knee osteoarthritis with a high degree were more likely to suffer from obese people (88.9%). Meanwhile, patients with a low degree of Osteoarthritis suffered more from regular people (83.3%). The statistical tests found a significant relationship between body mass index and the degree of joint damage in osteoarthritis patients [27]. OA patients who had BMI values above average mostly had more severe Kellgren-Lawrence grades, but the study stated that obesity could not be associated with the progression of knee osteoarthritis [28]. Meanwhile, another study conducted by Yusuf showed that obesity was associated with the progression of knee osteoarthritis [29].

In another study conducted by Widhiyanto, from the results of statistical tests, it was concluded that there was no significant relationship between BMI and the degree of knee osteoarthritis [30]. Another study conducted by Koentjoro also showed no significant relationship between BMI and the degree of bilateral knee osteoarthritis, according to Kellgren and Lawrence. Researchers mention that many other risk factors also work together in determining the degree of knee osteoarthritis, according to Kellgren and Lawrence suffered by patients [31].

RESEARCH METHOD

The research design used in this study is a descriptive analysis study with a cross-sectional or cross-sectional approach. This research was conducted at the UKI General Hospital. This research was conducted from November 2017 to January 2018 by taking medical records of Osteoarthritis patients in 2017. The population in this study were all medical records of patients with knee osteoarthritis at UKI General Hospital. The samples used in this study were all patients who met the

inclusion criteria: a) Patients diagnosed with knee osteoarthritis based on the results of clinical and radiological examinations, and b) Patients who have complete medical records. In this study, the samples taken for the study were 30 samples. In this study, the research instrument used was medical records of patients with knee osteoarthritis at UKI General Hospital. The method used in this study was to collect secondary data by researchers by using medical records of knee osteoarthritis patients and then taking data in the form of height and weight and then calculating the BMI value. After that, the researchers looked at the results of the radiological examination of the knee Osteoarthritis patient and saw the interpretation of the patient's joint space picture. The data obtained from the results of this study will be processed using the SPSS program to analyze the relationship (correlation) between BMI and knee osteoarthritis.

RESULT AND DISCUSSION

Based on the research results conducted on knee osteoarthritis patients who came to UKI General Hospital in 2017 who underwent treatment and performed radiological examinations, a sample of 30 patients was taken.

Table 2. Number of patients with knee osteoarthritis by age

Age	Frequency	%
Old Elderly (75-90)	4	13.3
Elderly (60-74)	15	50.0
Middle age (45-59)	11	36.7
Total	30	100.0

In this study, all patients with knee osteoarthritis who were sampled were elderly patients. Based on the WHO classification, the criteria for the elderly can be divided into middle age (45 – 59 years), old age (60 – 74 years), old age (75 – 90 years), and old age (> 90 years). In this study, no knee osteoarthritis patients were used as samples of very old elderly (> 90 years).

Based on table 2, there are 11 samples of middle age (45 – 59 years) or 36.7%, 15 samples (60 – 74 years old) or 50.0%, and four samples or 13.3% old elderly (75 – 90 years).

Table 3. Number of patients with knee osteoarthritis by joint gap and age

		Age			Total
		middle age	Elderly	old elderly	
Joint Gap	Narrowing	8	11	3	22
	%	36.4	50.0	13.6	100.0
	Not Narrowing	3	4	1	8
	%	37.5	50.0	12.5	100.0
Total		11	15	4	30
%		36.7	50.0	13.3	100.0

Based on table 3, there are patients with knee osteoarthritis with narrowed joint gaps in the middle-aged as many as eight samples (36.4%), the elderly as many as 11 (50) samples, and the very old elderly as many as three (13.6%) samples. Patients with knee osteoarthritis with non-narrowed joint space were three samples or 37.5% of middle-aged, elderly, four (50%) samples of elderly people, and 1 sample or 13.3% very old elderly.

This study found that all patients with knee osteoarthritis who were sampled were more than 40 years old, and most of them were in the elderly (60-74 years). Patients with knee osteoarthritis with narrowed joint gaps are primarily in the elderly (60-74 years), and the least are in the elderly (75-90 years). Patients with knee osteoarthritis with non-narrowed joint gaps are mainly in the elderly (60-74 years), and the least are in the elderly (75-90 years).

More patients with knee osteoarthritis were at the age of >55 years, while patients who were not favourable for knee osteoarthritis were more at the age of 25-55 years [5]. The incidence of knee osteoarthritis mainly occurs in people over 50 years old [21]. Likewise, most patients

with knee osteoarthritis were over 50 years old [25].

Table 4. Number of patients with knee osteoarthritis by gender

Gender	Frequency	%
Male	3	10.0
Female	27	90.0
Total	30	100.0

Based on table 4, there are three samples of male knee osteoarthritis or 10% and 27 samples of women or 90%.

Table 5. Number of patients with knee osteoarthritis by joint gap and gender

		Gender		Total
		Male	Female	
Joint Gap	Narrowing	3	19	22
	%	13.6	86.4	100.0
	Not Narrowing	0	8	8
	%	0	100.0	100.0
Total		3	27	30
%		10.0	90.0	100.0

Based on table 5, there are knee osteoarthritis sufferers with narrowed joint space with three samples of the male sex or 13.6% and 19 samples of female 86.4%. Patients with knee osteoarthritis with non-narrowed joint space with no sample of male gender and eight samples of female or 100%. In this study, it was found that women suffered from knee osteoarthritis more than men. Patients with knee osteoarthritis with narrowed joint gaps are the most common in women. Knee osteoarthritis sufferers with joint gaps are not narrowed the most in women.

Table 6. Number of patients with knee osteoarthritis by accompanying disease

Variable	Category	Frequency	
Disease	Diabetes mellitus	14	
	Hypertension	16	
	Heart	11	
	None	6	

Based on table 6, from 30 patients, there are 14 (46.7%) patients with knee osteoarthritis who suffered from diabetes mellitus, 16 (53.3%) patients were hypertension, 11 (36.7%) patients were heart disease, and six (20%) patients who did not suffer from any diseases.

Table 7. Number of patients with knee osteoarthritis based on joint gaps and past medical history

		Disease			
		Diabetes mellitus	Hypertension	Heart	None
Joint Gap	Narrowing	11	13	2	3
	%	50.0	59.1	9.1	13.6
	Not Narrowing	3	3	0	3
	%	37.5	37.5	0	37.5
Total		14	16	11	6
%		46.7	53.3	36.7	20.0

Based on table 7, from 22 patients with knee osteoarthritis with narrow joint space, there are 11 (50%) who suffer from diabetes mellitus, 13 (59.1%) suffered from hypertension, 2 (9.1%) suffered from heart disease, and no disease as many as three samples or 13.6 %. Of the 22 patients with knee osteoarthritis with non-narrowed joint space, three samples or 37.5% diabetes mellitus, three samples or 37.5% hypertension, no heart disease, and three samples or 37.5% no disease.

In this study, it was found that hypertension was the most suffered by patients with Osteoarthritis. Knee osteoarthritis sufferers with narrowed joint space are most common in knee osteoarthritis patients who have a history of hypertension, and the least are knee osteoarthritis patients who have a history of heart disease. Patients with knee osteoarthritis with non-narrowed joint gaps who have a history of diabetes mellitus, hypertension, and no disease are the same number and at least in patients with knee osteoarthritis who have a history of heart disease.

Table 8. Number of patients with unilateral and bilateral knee osteoarthritis

	Frequency	%
Unilateral	18	60.0
Bilateral	12	40.0
Total	30	100.0

Based on table 8, there were 12 samples of Osteoarthritis in both knees or bilateral or 40% and 18 samples or 60%

who had Osteoarthritis in only one knee or unilateral.

Table 9. Number of patients with right and left knee osteoarthritis

	Frequency	%
Left and *Right*	12	40.0
Right	12	40.0
Left	6	20.0
Total	30	100.0

Based on table 9, there are 12 (40%) patients with knee osteoarthritis on the right and left, 12 (40%) on the right side, 6 (20%) on the left side. This study found that knee osteoarthritis was most commonly affected on one side only or unilaterally. The side most affected is the right side.

Table 10. Number of patients with knee osteoarthritis by occupation

Profession	Frequency	%
Housewife	20	66.7
Civil Servants	4	13.3
Private	2	6.7
Pension	4	13.3
Total	30	100.0

Based on table 10, there are 20 (66.7%) houses wives suffer from knee osteoarthritis, 4 (13.3%) are civil servants, and 2 (13.3) are private, and 4 (13.3) are not working.

Table 11. Number of patients with knee osteoarthritis by joint gap and occupation

		Profession				Total
		Housewife	Civil Servants	Private	Pension	
Joint Gap	Narrowing	13	3	2	4	22
	%	59.1	13.6	9.1	18.2	100.0
	Not Narrowing	7	1	0	0	8
	%	87.5	12.5	0	0	100.0
Total		20	4	2	4	30
%		66.7	13.3	6.7	13.3	100.0

Based on table 11, there are 13 (59.1%) samples of Osteoarthritis of the knee with narrow joint gaps who work as housewives, three (13.6) patients are from civil servants of private-sector employees, and four (18.2%) who do not work or retire. Patients with knee osteoarthritis with non-narrowed joint gaps who work as housewives are seven (87.5%) patients, and civil servants are 1 (12.5%), no private sector, and no work or retirement.

In this study, it was found that most knee osteoarthritis sufferers worked as housewives. Patients with knee osteoarthritis with narrowed joint gaps mostly work like housewives, and the least are those who do not work or retire. Osteoarthritis knee sufferers with joint gaps are not narrowed mostly work like housewives, and those who work in the private sector and do not work there are none whose joint gaps are not narrowed.

Table 12. Number of patients with knee osteoarthritis based on average or abnormal BMI values

BMI	N	%
Normal	13	43.3
Abnormal	17	56.7
Total	30	100.0

In this study, the sample was divided into two categories: samples with normal and abnormal BMI values (underweight, pre-obese, obesity class 1, and obesity class 2) to be analyzed using the chi-square method.

Based on table 12, there were 13 samples of normal BMI or 43.3% and 17 samples of abnormal BMI or 56.7%.

Table 13. Number of patients with knee osteoarthritis based on BMI

BMI	N	%
Underweight	1	3.3
Normal	13	43.3
Preobese	12	40
Obesity class 1	3	10
Obesity class 2	1	3.3
Total	30	100.0

Based on table 13, knee osteoarthritis sufferers who have a BMI underweight as much as 1 (3.3%), regular patients are 13 (43.3%) patients, pre-obese as many as 12 (40%), obesity class 1 as many as 3 (10%), and obesity class 2 as much as 1 (3.3%) patients.

Table 14. Number of patients with knee osteoarthritis by joint gap

Joint Gap	N	%
Narrowing	22	73.3
Not Narrowing	8	26.7
Total	30	100.0

Based on the Kellgren-Lawrence classification, joint space narrowing has not occurred in grade 1 and has occurred in grade 2, grade 3, and grade 4 knee osteoarthritis patients, grade 3, grade 4 and the joint gap is not narrowed (grade 1) to be analyzed using the chi-square method.

Based on table 14, patients with knee osteoarthritis with narrowed joint space were 22 samples or 73.3%, and eight samples were not narrowed or 26.7%.

Table 15. Number of patients with knee osteoarthritis based on the Kellgren-Lawrence classification

Kellgren-Lawrence	N	%
Grade 1	9	30.0
Grade 2	20	66.7
Grade 3	1	3.3
Total	30	100.0

Based on table 15, knee osteoarthritis patients with grade 1 were nine samples or 30%, grade 2 were 20 samples or 66.7%, grade 3 was 1 sample or 3.3%, and grade 4 was not present.

Table 16. Number of patients with knee osteoarthritis based on joint gaps and normal and abnormal BMI values

		BMI		
		Abnormal	**Normal**	**Total**
Joint Gap	Narrowing	15	7	22
	%	68.2	31.8	100.0
	Not Narrowing	2	6	8
	%	25.0	75.0	100.0
Total		17	13	30
%		56.7	43.3	100.0

Based on table 16, patients with knee osteoarthritis with narrowed joint space and abnormal BMI were 15 samples or 68.2%, narrowed joint space, and normal BMI were seven samples or 31.8%, joint space was not narrowed, and abnormal BMI was two samples or 25.0%, joint space was not narrowed, and normal BMI was six samples or 75.0%. Based on the results of this study, it was found that more knee osteoarthritis patients with abnormal BMI values had narrowed joint gaps and more knee osteoarthritis patients with average BMI values had non-narrowed joint gaps.

Table 17. Number of patients with knee osteoarthritis based on the Kellgren-Lawrence classification and BMI

		BMI					Total
		Underweight	**Normal**	***Pre-Obese***	***Obesity Class 1***	***Obesity Class 2***	
Kellgren Lawrence	Grade 3	0	1	0	0	0	1
	%	0	100.0	0	0	0	100.0
	Grade 2	1	5	10	3	1	20
	%	5.0	25.0	50.0	15.0	5.0	100.0
	Grade 1	0	7	2	0	0	9
	%	0	77.8	22.2	0	0	100.0
Total		1	13	12	3	1	30
		3.3	43.3	40.0	10.0	3.3	100.0

Based on table 17, there is only 1 sample of knee osteoarthritis grade 3 or 100% with average BMI values. Grade 2 with a BMI underweight of 1 sample or 5%, average five samples or 25%, pre-obese ten samples or 10%, obesity class 13 samples or 15%, and obesity class 21 sample or 5%. Grade 1 with no sample underweight BMI, average as many as seven samples or 77.8%, pre-obese as many as two samples or 22.2%, obesity class 1 and obesity class 2 no samples.

This study found that knee osteoarthritis patients had abnormal BMI values more than average BMI values. The most abnormal BMI values are pre-obese, and the least are underweight and obesity class 2. Osteoarthritis knee sufferers with narrowed joint space more than those with non-narrowed joint space. Based on the Kellgren-Lawrence classification, the highest number of knee osteoarthritis sufferers is grade 2, and the least is grade 3.

Patients with knee osteoarthritis with narrowed joint gaps had the most abnormal BMI values. Patients with knee osteoarthritis with non-narrowed joint gaps had the most normal BMI values. In the Kellgren-Lawrence classification, grade 1 is the most experienced by patients with knee osteoarthritis with normal BMI, and grade 2 is the most experienced by patients with knee osteoarthritis with pre-obese BMI. Grade 3 only has knee osteoarthritis patients with normal BMI. Joint space narrowing has not occurred in grades 1, and joint space

narrowing has occurred in grades 2 and 3. So that joint space narrowing is most common in patients with pre-obese BMI values or BMI values between 25.0-29.9.

In this study, there were 30 patients with knee osteoarthritis who were used as samples. The average BMI of the 30 samples was 25.6. It means that, on average, patients with knee osteoarthritis at UKI General Hospital are overweight or pre-obese patients. In this study, H0 is a BMI value above normal cannot affect knee osteoarthritis in patients at UKI General Hospital in 2017 and Ha, which is a BMI value above average, can affect knee osteoarthritis in patients at UKI General Hospital in 2017. The results of chi-square analysis using Fisher's Exact Test shows that the p-value = 0.045, which indicates that the BMI variable has a p-value of less than the significance level = 0.05, it can be concluded that there is a relationship between BMI and knee osteoarthritis where a BMI value above normal can affect knee osteoarthritis so that H0 can be rejected. For abnormal BMI values, the odds ratio (OR) is 6.429, which means that patients with abnormal BMI risk 6,429 times greater risk of joint space narrowing than patients with normal BMI.

Based on the results of previous studies reporting BMI affects the severity of knee osteoarthritis, some get the results that BMI is not proven to affect the severity of knee osteoarthritis. So, it can be concluded that other risk factors can affect the severity of knee osteoarthritis, such as age, gender, occupation, patient history, trauma, and other factors that may jointly increase the risk of knee osteoarthritis severity. However, it is still undeniable that excess body weight can worsen the degree of knee osteoarthritis because it increases the burden that the knee of knee osteoarthritis sufferers must bear. In addition, with the thinning of the cartilage layer and over time, if excess weight lasts for a long time, the joint space will narrow and worsen knee osteoarthritis. As a result, the patient will find it difficult to walk and will experience pain in the knee affected by Osteoarthritis and will impact the patient's quality of life. Therefore, it is advisable for patients over 40 years of age who have a BMI value above normal to keep their weight within normal limits.

The results obtained from the statistical test analysis showed a relationship between BMI and the incidence of knee osteoarthritis, where patients who had abnormal BMI values had more images of joint space narrowing. The results of this study indicate that a BMI value above average (more than 24.9) can affect the occurrence of joint space narrowing in Knee Osteoarthritis patients. It can be seen from the data results obtained were more patients with BMI values above average (more than 24.9) experienced joint space narrowing than patients with average BMI values.

CONCLUSION

Based on research that has been conducted on 30 patients with knee osteoarthritis at UKI General Hospital in 2017, the results showed that there was a relationship between BMI and the incidence of knee osteoarthritis. This study indicates that BMI values above average (more than 24.9) can affect the occurrence of joint space narrowing in patients. Patients with abnormal BMI have a risk of 6,429 times the risk of joint space narrowing compared to patients with normal BMI. The mean BMI value of patients with knee osteoarthritis at UKI General Hospital is 25.6. It means that, on average, patients with knee osteoarthritis at UKI General Hospital are overweight or pre-obese patients. People are expected to maintain ideal body weight to avoid obesity. Ways that can be done such as regular exercise, maintaining a balanced diet by maintaining a healthy diet, and immediately taking treatment if the initial symptoms of knee osteoarthritis occur to avoid getting the disease worse, especially for people who are elderly and who are overweight and to reduce activity which is too heavy a physique that uses the knee joint. Health care workers are expected to be able to carry

out initial screening to be aware of the early symptoms of knee osteoarthritis such as joint pain, stiffness, muscle weakness, swelling, joint deformity/joint enlargement, reduced range of motion and joint movement function, and the presence of crepitus. It is so that patients can take treatment earlier to avoid more severe complications.

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