

# Body Mass Index as the Risk Factor Affecting Knee Osteoarthritis of the Elderly

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## Abstract

**Introduction:** Osteoarthritis is a disease that progresses over time and culminates in the destruction of articular and joints. Indonesia Basic Health Research (RISKESDAS) 2013 shows that East Nusa Tenggara Province have the highest prevalence of the rheumatic disease in Indonesia, about 33.1%.

**Method:** This research is an observational-analytic study with a cross-sectional design, which aims to determine the factors affecting osteoarthritis of the elderly at Sikumana Community Health Center, Maulafa District, Kupang City, East Nusa Tenggara, Indonesia from December 2018 to February 2019.

**Result:** In this research, body mass index/BMI (PR=1.21, p=0.037) has a significant correlation to osteoarthritis of the elderly, yet gender (PR=1.02, p=0.839) and history of knee trauma (PR=1.08, p=0.453) have no significant correlation to osteoarthritis of the elderly.

**Conclusion:** An overweight body increases the mechanical pressure of the knee joint, which causes osteoarthritis. The research shows, women have a higher risk of osteoarthritis compared to men. The higher the BMI, the prevalence of osteoarthritis increases significantly. Around 41% of the elderly with osteoarthritis have obesity. Amongst any other risks, obesity shows a correlation with the prevalence of osteoarthritis. Patients' awareness of the body mass index (BMI) should be increased to reduce the prevalence of osteoarthritis.

**Keywords:** Osteoarthritis; Elderly; Risk Factors; Body Mass Index

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## Introduction

Osteoarthritis is a disease that progresses over time and culminates in the destruction of articular cartilage. Osteoarthritis of the knee is very common, affecting 12.4 million (33.6%) adults over the age of 65. Thus, with an increasing elderly population, the treatment of knee osteoarthritis has become a major healthcare issue. Interestingly, women are more affected and burdened by osteoarthritis of the knee than men [1].

In Indonesia, osteoarthritis is the most common rheumatic disease compared to others. According to the World Health Organization (WHO), the number of patients with osteoarthritis in Indonesia is about 8.1% [2]. Indonesia Basic Health Research (RISKESDAS) 2013 states that East Nusa Tenggara Province had the highest number of patients with rheumatic diseases (33.1%) [3].

Global estimates are that 9.6% of men and 18.0% of women >60 years of age have symptomatic (painful) osteoarthritis. Eighty percent of patients with osteoarthritis have limitations in movement and 25% cannot perform their major daily activities. According to WHO, the elderly is a classification of people who are between 60-74 years old [4].

This research aims to determine the factors affecting osteoarthritis of the elderly at Sikumana Community Health Center.

## Method

This research is an observational-analytic study with a cross-sectional design conducted in Sikumana Community Health Center, Maulafa District, Kupang City, East Nusa Tenggara, Indonesia, from December 2018 to February 2019. Consecutive sampling was used in this survey, with a total of 134 respondents. All those respondents went to Sikumana Community Health Center for a check-up and get medication.

The variables in this research are osteoarthritis, gender, body mass index (BMI), and history of knee trauma. The Chi-Square statistic in SPSS version 21.0, for the data analysis, was used in this research. Each variable is cross-tabulated to get the fixed data.

## Result

From the cross-sectional study that was conducted at Sikumana Community Health Center, Maulafa District, Kupang City, East Nusa Tenggara, Indonesia from December 2018 to February 2019, the total of patients with osteoarthritis were 105 from the total of 134 patients. From the gender data, there were 39 men & 95 women. From the body mass index (BMI) data, there were 55 obese patients & 79 non-obese patients. From the history of knee trauma data, there were 30 patients with a history of knee trauma & 104 patients with no history of knee trauma.



In this research, body mass index (BMI) has a significant correlation to osteoarthritis, while gender and history of knee trauma have no significant correlation to osteoarthritis of the elderly. Women have a higher risk (71%) of osteoarthritis compared to men (29%). Obese patients with osteoarthritis are about 41%. Patients with a history of knee trauma who have osteoarthritis are about 22% (Tables 1-4).

**Table 1:** The distribution of patients based on gender, body mass index (BMI), and history of knee trauma.

Variable	Category	Frequency	Percentage (%)
Osteoarthritis	(+)	105	78
	(-)	29	22
Gender	Men	39	29
	Women	95	71
Body Mass Index (BMI)	Obese	55	41
	Non-Obese	79	59
History of Knee Trauma	(+)	30	22
	(-)	104	78

**Table 2:** Bivariate analysis between gender with osteoarthritis of the elderly.

Variable	Category	Gender		PR (Prevalence Ratio)	p-value
		Men	Women		
Osteoarthritis	(+)	31	74	1.02	0.839
	(-)	8	21		

**Table 3:** Bivariate analysis between body mass index (BMI) with osteoarthritis of the elderly.

Variable	Category	BMI (Body Mass Index)		PR (Prevalence Ratio)	p-value
		Obese	Non-Obese		
Osteoarthritis	(+)	48	57	1.21	0.037
	(-)	7	22		

**Table 4:** Bivariate analysis between the history of knee trauma with osteoarthritis of the elderly.

Variable	Category	History of Knee Trauma		PR (Prevalence Ratio)	p-value
		(+)	(-)		
Osteoarthritis	(+)	25	80	1.08	0.453
	(-)	5	24		

## Discussion

Osteoarthritis is a disease that progresses and culminates in the destruction of articular cartilage, and affects 12.4 million (33.6%) adults over the age of 65. Osteoarthritis is classified into two groups, e.g. primary osteoarthritis & secondary osteoarthritis. The primary osteoarthritis is idiopathic and is caused by the genetic factor, which is the abnormality of the collagen that makes it easier to break. The secondary osteoarthritis is caused by endocrine abnormality, inflammation, metabolic, growth, micro and macro trauma, excess immobility, obesity, etc [2].

World Health Organization (WHO) data also demonstrated that osteoarthritis moved from the 12th to the 6th leading cause of years lost to disability or morbidity between 2002 and 2007. Increases in life expectancy and aging populations are expected to make osteoarthritis the fourth leading cause of disability by the year 2020 [4].

The decision tree format of the American College of Rheumatology (ACR) classification criteria for clinical knee osteoarthritis was applied to the collected examination data. As all participants in our study satisfied the age criteria, the ACR clinical criteria for knee osteoarthritis were fulfilled in the following circumstances [5]:

- crepitus (+) and morning stiffness > 30 min and bony enlargement (+); or

- crepitus (+) and morning stiffness ≤ 30 min; or
- crepitus (-) and bony enlargement (+) [where (+) = present, (-) = absent].

Osteoarthritis can affect men and women. Primary osteoarthritis mostly affects post-menopause women and secondary osteoarthritis mostly affects men [6]. It is often described as a chronic degenerative disease and thought by many to be an inevitable consequence of growing old. Osteoarthritis was defined as the presence of knee symptoms in a patient with ipsilateral (Kellgren & Lawrence) grade 2 or greater radiographic changes. The prevalence of radiographic osteoarthritis increased with each decade of life from 33% among those aged 60-70 to 43.7% among those over 80 years of age. The prevalence of symptomatic knee osteoarthritis in all subjects was 9.5% and increased with age in women but not in men [7]. There were a significantly higher number of women with symptomatic disease [1]. In this research, the bivariate analysis between gender with osteoarthritis of the elderly shows the prevalence ratio (PR)=1.02. The p-value=0.839, which means there is no significant correlation between both variables.

Obesity can increase the mechanical pressure at the joints that bear the body, which commonly causes knee osteoarthritis. One study in Chingford shows that for every 2 units increasing of body mass index (BMI), or about 5 Kg of body weight, the odds ratio of radiographic knee osteoarthritis increases by 1.36 points. The study concludes that the risk of knee osteoarthritis increases with heavier bodyweight [2]. First documented in 1945, the strong association between obesity and knee osteoarthritis has been widely verified. Leach and colleagues found that 83% of their female subjects who had knee osteoarthritis were obese compared with 42% of the control group. In a case-controlled study of 675 matched pairs, Coggon and colleagues determined that the risk for knee osteoarthritis in people who had a body mass index of 30 kg/m<sup>2</sup> or greater was 6.8 times that of normal-weight controls. Felson and colleagues showed that a 5.1 Kg loss in body mass over 10 years reduced the odds of developing osteoarthritis by more than 50% [8]. In this research, the bivariate analysis between body mass index (BMI) with osteoarthritis of the elderly shows the prevalence ratio (PR)=1.21. The p-value=0.037, which means there is a significant correlation between both variables.

Previous knee trauma is a risk factor for knee osteoarthritis [9]. According to the study of Silverwood V, et al. (2015) [10], thirteen cohort studies were included in the meta-analysis of previous knee injury as a risk factor for the onset of knee osteoarthritis with only one showing that those with a previous knee injury had a lower, though the non-significant risk of developing knee osteoarthritis. The other studies all showed an increased risk of knee osteoarthritis with a prior injury [10]. In this research, the bivariate analysis between the history of knee trauma with osteoarthritis of the elderly shows the prevalence ratio (PR)=1.08. The p-value=0.453, which means there is no significant correlation between both variables.

The limitation of this research is the lack of radiographic examination since it's important to diagnose knee osteoarthritis using X-ray to determine the Kellgen-Lawrence (KL) grading of knee osteoarthritis.

## Conclusion

Body Mass Index has a significant correlation to osteoarthritis at Sikumana Community Health Center, Maulafa District, Kupang City, East Nusa Tenggara, Indonesia. Women have a higher risk of



osteoarthritis compared to men. Patients' awareness of body mass index (BMI) should be increased to reduce the prevalence of osteoarthritis.

The limitation of this research is the lack of radiographic examination at Sikumana Community Health Center, Maulafa District, Kupang City, East Nusa Tenggara, Indonesia.

### Conflicts of Interest

No conflicts of interest were declared.

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### Patient Consent

All the 134 respondents had received the information that their data will be put in this research. Each of them had agreed and signed the informed consent.

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