

## THE RELATIONSHIP OF BODY MASS INDEX AND BLOOD PRESSURE WITH TYPE 2 DIABETES ON GERIATRIC AT RS PHC SURABAYA

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### ABSTRACT

**Introduction:** Diabetes Mellitus is a metabolic syndrome that occurs due to abnormalities in insulin secretion, insulin action, or both. The pathophysiology of Type 2 Diabetes Mellitus is insulin resistance in muscle and liver cells, as well as failure of pancreatic beta cells. The most common risk factors for diabetes mellitus are obesity, hypertension, dyslipidemia, lack of physical activity, and others. The Indonesian population still occupies a high position regarding the risk factors above. **Objective:** to analyze the relationship between body mass index and blood pressure with type 2 diabetes in geriatric at RS PHC Surabaya. **Method:** This research is an analytic-observational with a cross-sectional approach and using convenience sampling. **Result:** the number of subjects obtained was 68 people with the results of the analysis showing that there was not a strong enough relationship between the variable body mass index and type 2 diabetes mellitus ( $p$ -value = 0.37) with the strength of the correlation ( $r$ -value = 0.10) and blood pressure on duration of type 2 diabetes mellitus ( $p$  value= 0.67) with correlation strength ( $r$  value= 0.16). **Conclusion:** there is no relationship between body mass index and blood pressure with type 2 diabetes in geriatric.

**Keywords:** body mass index, blood pressure, type 2 diabetes.

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## INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disorder whose main finding is chronic hyperglycemia. This disease can be caused by 2 things, namely, impaired insulin secretion or impaired insulin work. DM cases have a prevalence that continues to increase every year.

According to the International Diabetes Federation (IDF), 9% of women suffer from diabetes mellitus and 9.65% of men, which could increase due to changes in lifestyle, especially in Indonesian society. According to data from the Ministry of Health of the Republic of Indonesia in 2019, Indonesia is the 7th country with the highest number of DM sufferers and this makes Indonesia the country with the highest number of DM sufferers in Southeast Asia<sup>1</sup>.

The most common risk factors for diabetes mellitus are obesity, hypertension, dyslipidemia, lack of physical activity, and others. The Indonesian population still occupies a high position regarding the risk factors above.

Obesity is often associated with diabetes mellitus. In type 2 diabetes, obesity is associated with insulin resistance. Pancreatic  $\beta$  cells produce sufficient amounts of insulin to overcome falling insulin levels so that glucose remains in a normal state. At least 80% of Type 2 DM

patients are obese which can worsen the patient's condition<sup>2,3</sup>. Diabetes Mellitus and hypertension are two things that often occur with age, especially Type 2 DM. This is what causes Indonesia to be included in the top 10 countries with the most diabetes sufferers<sup>4</sup>.

In Indonesia, elderly people are categorized as those aged over 60 years. The high rates of obesity and hypertension in Indonesia have increased the number of diabetes mellitus patients. This phenomenon occurs not only in developing countries, but this problem is also a major problem in developed countries, so this research aims to find the relationship between Body Mass Index and blood pressure on the duration of type 2 diabetes mellitus, especially in the elderly.

## METHODS

This research was conducted using an analytical-observational study design with a cross-sectional method in elderly patients with type 2 DM at PHC Surabaya Hospital. The sample for this study used a minimum of 67 type 2 DM patients at PHC Hospital aged >60 years who met the research criteria. Samples for Body Mass Index and blood pressure were taken by measuring directly on the patient, while the data in the medical record was used to view data on elderly patients with type 2 diabetes

mellitus who were treated at the PHC Surabaya Hospital. Inclusion criteria include (1) Elderly patients suffering from Type 2 DM at PHC Surabaya Hospital, (2) Patients diagnosed with Type 2 DM accompanied by hypertension, (3) The medical records used are the most recent outpatient medical records, (4) The blood pressure used is a measurement with the latest data from the patient, and the exclusion criteria are (1) Patients whose data is incomplete, (2) Patients who are not willing to fill out informed consent.

This analysis is used to test BMI with type II DM and blood pressure with type II DM, so two bivariate tests will be carried out using the contingency coefficient test.

## RESULT

**Table 1. Distribution of Respondents' Body**

Duration	Body Mass Index		
	Thin	Normal	Obese
< 5 Years	1	9	31
> 5 Years	0	7	20

The distribution data in the table above shows that patients with Type 2 DM less than 5 years old had a body mass index of 1 thin person, 9 normal people, and 31 people who were obese. In Type 2 DM patients who were more than 5 years old, 7 people were normal and 20 people were obese.

**Table 2. Distribution of Respondents' Blood**

Duration	Blood Pressure		
	Normal	HT 1	HT 2
< 5 Years	8	22	11
> 5 Years	2	16	9

The table above is the distribution of duration of Type 2 DM with Blood Pressure without looking at the subject's gender. In Type 2 DM with a duration of less than 5 years, there were 8 patients with normal blood pressure, 22 patients with grade 1 hypertension, and 11 with grade 2 hypertension. Type 2 Diabetes Mellitus with a duration of more than 5 years had normal blood pressure in 2 patients. There were 16 patients with grade 1 hypertension, and 9 patients with grade 2 hypertension.

**Table 3. Statistical Test Results of the Relationship between Body Mass Index and Duration of Type 2 DM**

Variable	Body Mass Index			Total	
	Thin	Normal	Obese		
Type 2 DM	<5 Years	1 (2,4)	9 (22,05)	31 (75,6)	41 (100)
	>5 Years	0 (0%)	7 (25,9)	20 (74,1)	27 (100)
Total		1 (1,5)	15 (23,5)	51 (75,0)	68 (100)

The table above shows the relationship between Body Mass Index and the duration of Type 2 DM which was tested using the non-parametric contingency coefficient test in the SPSS application which resulted in  $r=0.106$  with  $p=0.67$ . The results obtained are not significant, namely  $p > 0.05$ , so there is not a strong enough correlation between Body Mass Index and Type 2 DM in the elderly. This research hypothesis was rejected because the  $p$ -value was  $> 0.05$ .

**Table 4. Statistical Test Results of the Relationship between Blood Pressure and the Duration of Type 2 DM.**

Variable	Blood Pressure			Total	
	Normal	HT 1	HT 2		
Type 2 DM	<5 Years	8 (19,5%)	22 (53,7%)	11 (26,8%)	41 (100)
	>5 Years	2 (7,4%)	16 (59,3%)	9 (33,3%)	27 (100)
<b>Total</b>	<b>10</b> <b>(14,7%)</b>	<b>38</b> <b>(55,9%)</b>	<b>20</b> <b>(29,4%)</b>	<b>68</b> <b>(100)</b>	

In the table above, there is an analysis of the relationship between blood pressure and Type 2 DM in the elderly who were tested with SPSS using the non-parametric contingency coefficient test which resulted in  $r=0.167$  with  $p=0.37$  ( $p>0.05$ ). These results stated that there was not a strong enough correlation between blood pressure and Type 2 DM in the elderly because  $p>0.05$ , so the hypothesis was rejected.

## DISCUSSION

The results of data collection showed that 1 person was thin, 16 people were normal, and 51 people were obese. The subjects used were elderly people aged  $>60$  years and those who were obese were dominated by 34 women with 17 obese men. The amount of obesity that dominates in this study is in line with the most common risk factors for Diabetes Mellitus sufferers, especially type 2 in Indonesia, namely obesity and hypertension. According to studies in England, 90% of adult Type 2 DM sufferers are overweight or obese.

The results of data collection regarding blood pressure in elderly patients with Type 2 Diabetes Mellitus showed that there were 10 people with normal blood pressure, 38 people with grade 1 hypertension, and 20 people with grade 2 hypertension. The largest finding in data collection here was the grade 1 hypertension category which was dominated by 21 women and 17 men. The number of people with grade 1 hypertension dominates, proving that the highest risk factor for Type 2 Diabetes Mellitus is hypertension, which is in line with data from the Ministry of Health.

## Relationship between Body Mass Index and duration of Type 2 DM.

The results of the analysis carried out in this study showed that there was no strong correlation between Body Mass Index and the duration of Type 2 DM. This is in line with research by Sasongko A et al., which stated that there was no relationship between these two variables<sup>5</sup>. The obesity category that dominates the subject is influenced by many factors, not only because of the Type 2 Diabetes Mellitus he suffers from. Other influencing factors such as stress, diet, and environmental conditions make it difficult for patients to control the food they eat. Controlled diabetes mellitus and the absence of weight loss in patients are some of the causes of

many categories of obesity in type 2 diabetes mellitus<sup>6</sup>.

### **Relationship between blood pressure and duration of type 2 diabetes.**

According to Errick et al's research, changes in blood pressure during the duration of type 2 diabetes mellitus are influenced by many things. There is no direct relationship between the two variables above, but other factors such as the patient's mood/mood also have an influence<sup>7</sup>. When conducting research, many control patients who had blood pressure measurements were found to have degrees 1 and 2 hypertension.

This phenomenon was not directly due to the duration of type 2 diabetes mellitus, however, the patient had other problems such as stress, work problems, and so on. The patient's type 2 diabetes mellitus condition can cause hypertension and is the biggest risk factor after obesity<sup>8</sup>.

### **CONCLUSION**

Based on the results of analysis after research conducted at PHC Surabaya Hospital regarding the relationship between body mass index and blood pressure and type 2 diabetes mellitus in the elderly, it can be concluded that there is no relationship between body mass index and blood pressure and the duration of type 2 diabetes mellitus in the elderly.

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