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CORRELATION BETWEEN BODY MASS INDEX WITH BLOOD PRESSURE SYSTOLIC AND DIASTOLIC STUDY IN FACULTY OF MEDICINE UNIVERSITAS SWADAYA GUNUNG JATI

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ABSTRACT

Background: An increase in body mass index significantly excess fat in the body. It can affect blood pressure through sympathetic nerve pathways, renin-angiostensin and inflammation. Fat deposits on blood vessel walls cause atherosclerosis, narrowing, increasing blood pressure, and increasing heart work. So that BMI can be a contributing factor to cardiovascular disease. **Objective:** To know the correlation between body mass index and blood pressure in medical students of Universitas Swadaya Gunung Jati (UGJ) **Methods:** This research is an analytic observational study with a Cross Sectional design. The correlation analysis method uses the Spearman rank correlation test. The measuring instruments used include weight scales, microtoice, and digital tension. Respondents totaled 262 preclinic students from the Faculty of Medicine UGJ. **Results:** Based on the spearman rank correlation test, a significant correlation was found between body mass index with systolic and diastolic blood pressure. The p-value for both is (p=0.000), indicating a correlation. The strength of the correlation was weak positive with values of (r=0.375) for systolic blood pressure and (r=0.337) for diastolic blood pressure. That is, higher the BMI of a person, the higher the blood pressure. **Conclusion:** There is a significant correlation with weak positive strength between body mass index with systolic and diastolic blood pressure in Medical Students.

Keywords: *Body Mass Index, Blood Pressure, Faculty od Medicine, Hypertension, Obesity*

INTRODUCTION

Blood pressure is one of the essential vital signs. The greater the blood pressure, the greater the blood flows. Normally, blood pressure is <120 mmHg / <80 mmHg.[1,2] Cardiovascular function (cardiac output and peripheral resistance) both of which can be affected by increased blood volume, respiration pumps, increased red blood cell count, autonomic nerves and body mass index.[1,2] In Cirebon city 36.46% of 2,145 respondents had hypertension.[3] Body mass index (BMI) is an indicator to see the ratio of ideal body weight. In Cirebon City, 19.21% of 2,054 respondents were obese.[3] High body mass index can affect the work of the heart organ in pumping blood, increasing the total length of blood vessels to the periphery will cause systemic vascular resistance which ends in an increase in mean arterial pressure.[1,4] High blood pressure can cause hemorrhagic stroke due to rupture of blood vessels in the brain. High blood pressure can affect cognitive function.[5,6] Blood pressure can reduce blood flow to the brain resulting in ischemic stroke.[1,7] The mechanism by which body mass index affects blood pressure is complex. One simple mechanism is that fat deposits will damage the kidneys, which can cause blood pressure to rise due to activation of the renin angiostensin-aldosterone system (RAAS).[8] Based on these problems, researchers are interested in knowing correlation between between BMI and systolic and diastolic blood pressure in medical students.

METHODS

This study provides an overview of analytic observational study with a cross sectional research design. The population in this study was students of the Faculty of Medicine, Universitas Swadaya Gunung Jati (UGJ) Cirebon. The sample of this study was taken from the study population who met the inclusion criteria (actively registered students) and did not include exclusion criteria (having a family history of hypertension). This study uses a probability sampling method with the Stratified Random Sampling technique, which is carried out on strata that have been divided by the number of populations with the same characteristics, and takes random samples from each stratum and combines them into a sample used in research. Numbering 262 people with the required sample size of 71 samples in active students of class 2022, 70 samples in active

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students of 2021, 58 samples in active students of class 2020, 63 samples in active students of 2019. BMI data is obtained from the results of calculating height and weight, and blood pressure data is obtained from examination using a digital stethoscope. The results obtained were analyzed using the Spearman rank correlation test.

RESULTS

Respondent Characteristics

The characteristics of the respondents used in this study were classified based on: Gender, Smoking Habit, Coffee Consumption, Sleep, BMI, Systolic Blood Pressure and Diastolic Blood Pressure. Following are the distribution results based on respondent characteristics.

Based on Table 1, that the number of men (39.7%) is less than the number of women (60.3%). Most of the 229 respondents did not smoke (87.4%) and a small proportion of 33 respondents smoked (12.8%). Most of the 185 respondents (70.6%) who consume coffee and a small number of 77 respondents (29.4%) who do not consume coffee. Most of the 194 respondents slept inadequately (73.7%), a small proportion of 69 respondents slept adequately (26.3%). Most of the BMI of medical students is in the normal category 133 respondents (50.8%) with an average BMI of 21.55 and a small portion of 6 respondents (2.3%) with an average BMI of 37.42. Most of the respondents were in the prehypertension category as many as 131 respondents (50.0%) with an average blood pressure of 128.23 mmHg and a small proportion of respondents were in the hypertension 1 category as many as 26 respondents (9.9%) with an average blood pressure of 144.46 mmHg. Most of the medical students were in the normotensive category as many as 112 respondents (42.7%) with an average blood pressure of 72.97 mmHg and a small proportion of respondents were in the hypotensive category as many as 3 respondents (1.1%) with an average blood pressure of 57.67 mmHg.

The correlation between BMI with SBP is significant with a p value 0.000 and a spearman rank correlation coefficient of 0.375, which means that there is a weak positive correlation, the greater the BMI, the greater the SBP. The correlation between BMI with DBP is significant with a p value of 0.000 and a spearman rank correlation coefficient value of 0.337 which means that there is a weak positive correlation, the greater the BMI, the greater the DBP.

Table 1. Frequency Distribution Gender

Characteristics	BMI*	Mean (Standar Deviation)*	Number (n)	Percentage (%)
Gender				
Male			104	39.7
Female			158	60.3
Total			**262**	**100.0**
Smoking Habit				
Smoking			33	12.8
No Smoking			229	87.4
Total			**262**	**100.0**
Coffee Consumption				
Coffee Consumption			185	70.6
No Coffee Consumption			77	29.4
Total			**262**	**100.0**
Sleep				
Get Enough Sleep			69	26.3
Not Enough Sleep			193	73.7
Total			**262**	**100.0**
BMI				
Skinny	17.37 (0.8753)		40	15.3
Normal	21.55 (1.841)		133	50.8
Overweight	26.95 (1.395)		60	22.9
Obesity 1	32.22 (1.388)		23	8.8
Obesity 2	37.42 (1.044)		6	2.3
Total			**262**	**100.0**
Systolic Blood Pressure				
Normotensi		109.94 (6.742)	105	40.1
Prehypertension		128.23 (5.009)	131	50.0
Hypertension 1		144.46 (3.313)	26	9.9
Total			**262**	**100.0**
Diastolic Blood Pressure				
Hypotension		57.67 (3.215)	3	1.1
Normotension		72.97 (4.195)	112	42.7
Prehypertension		84.37 (2.590)	98	37.4
Hypertension 1		93.54 (2.246)	39	14.9
Hypertension 2		105.90 (4.748)	10	3.8
Total			**262**	**100.0**

*Data distribution is normal (p >0.05).

DISCUSSION

1.1 Body Mass Index

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The gender characteristics in this study were mostly women as many as 158 people (60.3%) while men were 104 people (39.7%), in line with research conducted by Azzubaidi *et al.* in 2023 where the largest number of respondents were women with 48 respondents (66.7%) while male respondents were 24 people (33.3%) because of the unbalanced number of gender distribution, it cannot present nutritional status based on gender properly.[9]

The results of this study found that most of the 133 respondents (50.8%) had a normal body mass indexcategory, and a small proportion were obese as many as 6 respondents (2.3%). This research is in line with Kristantio and Halim's research in 2019 which stated that 78 respondents out of 95 respondents had normal BMI.[10]

Body mass index is a value obtained from calculating height and weight, which can be used as an indicator to assess whether a person is underweight, normal or overweight.[11] Factors that can affect body mass index include energy intake, family history and lifestyle, genetics, and cancer.[12,13] This can be a concern because in the overweight category or even obesity is one of the initial factors for elevated blood pressure at all ages, because the risk of hypertension in someone who is overweight or above is 2 to 6 times more vulnerable than someone with a normal weight.[9]

1.2 Blood Pressure

The results showed that 131 people (50%) experienced prehypertension and a small proportion experienced hypertension 1 in the amount of 26 people (9.9%) on SBP. This is in line with research conducted by Johansyah, Lestari, and Herawati in 2020 where 42 respondents (53.2%) experienced prehypertension in SBP.[14]

Diastolic blood pressure data obtained in this study were 112 people (42.7%) experiencing normotension, and 98 people (37.4%) experiencing prehypertension, this is not in line with research conducted by Johansyah, Lestari, and Herawati in 2020 where the number of respondents was 19 people (24.1%) experiencing normotension and 40 people (50.6%) experiencing prehypertension.[14]

1.3 Correlation Between Body Mass Index with Systolic and Diastolic Blood Pressure

This study found a significant positive correlation between BMI and blood pressure, especially systolic and diastolic blood pressure. Statistical results showed that there was a p value of 0.000 for both blood pressure parameters. This indicates a strong level of significance. The correlation coefficient of the correlation between BMI and SBP r of 0.375 shows a weak positive correlation strength, then the correlation coefficient of the correlation between BMI and DBP r of 0.337 shows a weak positive correlation strength as well. This is in accordance with the hypothesis proposed by the researcher, stating that there is a positive correlation between body mass index and blood pressure. The greater the BMI value, the greater the systolic and diastolic blood pressure.

Kristantio and Halim in 2019 which states that there is a correlation between body mass index and blood pressure with a value of (p value=0.005)[10]. Research conducted by Johansyah, Lestari, and Herawati which states that there is a weak positive correlation with a value of (p value=0.003) and (p value=0.005) significantly between systolic and diastolic blood pressure of weak strength with a correlation coefficient (r=0.330) and (r=0.316)[14]. This study is in line with research conducted by Atmojo, Hanifah, and Setyorini in 2020 which states that there was a correlation between BMI and blood pressure with p value 0,040 (p value <0.05) using chi-square test.[15]

An increase in body mass index can indicate the presence of excess fat in a person's body, which can affect blood pressure through RAAS, the sympathetic nervous system, and vascular inflammatory factors.[10,16] Fat accumulation in blood vessel wall tissue can cause endothelial dysfunction leading to atherosclerosis.[10] Atherosclerosis can cause the blood vessel wall to become thick, thus inhibiting blood flow because the diameter of the blood vessels becomes narrow, with narrow blood vessels can cause increased heart work, as well as increased total peripheral pressure which can increase blood pressure slowly.[10,14]

Systolic blood pressure that is too high for too long can destabilize the heart to pump blood throughout the body, this can cause thickening of the left ventricular muscle which makes it stiff, this causes systolic heart failure because the heart's ability to pump blood throughout the body

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decreases. Diastolic heart failure is defined as impaired relaxation and impaired ventricular filling, disruption of ventricular filling results in decreased blood flow.[17]

CONCLUSION

Most of medical students had normal BMI, systolic blood pressure in the prehypertension category and diastolic blood pressure in the normotensive category. The results of the study illustrate a weak correlation in a positive direction between BMI and systolic and diastolic blood pressure. A higher BMI can be associated with a higher systolic and diastolic blood pressure.

ETHICAL APPROVAL

This study has recieved etchical approval from Ethics Commision of the faculty of medicine Universitas Swadaya Gunung Jati with No.49/EC/FKUGJ/V/2023.

CONFLICTS OF INTEREST

There is no conflicts of interest affecting the results of this article

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AUTHOR CONTRIBUTIONS

Conseptualization, original draft preparation and editing, supervision, KS: manuscript reviewing, MW: writing and editing, MAN.

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