Original Research

IJNHS

Body Mass Index in adults aged 20-75 years related to Metabolic Parameter in Marginal *Posbindu* PTM Area DKI Jakarta

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Article information

Article history:
Received; February 03th, 2021
Revised: February 10, 2021
Accepted: March 20, 2022

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International Journal of Nursing and Health Services (IJNHS)
Volume 5, Issue 3, June 20th, 2022
DOI: 10.35654/ijnhs.v5i3.512
E-ISSN: 2654-6310

Abstract

Background: Obesity or high body mass index is one of the factors that cause changes in metabolic parameters, including blood sugarat times, whereas obesity with a high BMI> 25 kg / m2 is one of the factors driving Diabetes Mellitus. Obesity can also cause obesity to cause many problems, thereby increasing a person's risk of developing degenerative diseases such as hypertension and cancer. **Objective** The study aimed to examine the relationship between body mass index and instantaneous blood sugar, cholesterol, uric acid, and blood pressure in adults aged 20-75 years in the marginal area of Posbindu PTM Dki Jakarta. **Methods**: A cross-sectional study was applied in this study. The data was carried out from secondary data from the North Jakarta LKC Dompet Dhuafa Research. A total of 657 samples were selected using (random cluster sampling).
Results: The results found that. There is a significant relationship between BMI and blood glucose, with a p-value of (≤ 0.05) and a ratio value of 0.445 at the age of 20-30. A significant relationship exists between BMI and blood glucose, with a p-value of 0,027(≤ 0.05) and a ratio value of – 0.111 at 50-75 years old.

Keywords: Body Mass Index (BMI), Age, Metabolic parameters

INTRODUCTION

Indonesia is one of the developing countries that is undergoing a rapid nutritional transition. Obesity rates are increasing, and Indonesia is currently facing a double burden of malnutrition and more nutrition. In addition to increasing the number of overweight and obesity in children and adults, this is one form of malnutrition that threatens future generations and increases the risk of chronic diseases (1). overweight (Obesity) is a state of abnormal or excessive fat buildup that can interfere with health; one way to measure a person's nutritional status is by using the formula ofbody mass index (BMI). BMI is the value taken from the calculation of body weight (BB) in kilograms of square height (TB) in meters with the formula BB/TB² (KG/m²)(2).

Based on the results of riskesdas analysis 2018, the known nutritional status of adults over 18 years in Indonesia, the prevalence of overweight is 13.6% with BMI >25-27 kg/m2, and obesity prevalence is 21.8% with BMI > 27 kg/m² (3). The prevalence of obesity will increase at the age of over 35 years, then decrease again at 60 years and above (4). According to the Health Profile of DKI Jakarta in 2017, women who are obese reached 5.92%, male obesity 4,92%, and in North Jakarta, the obesity rate of adults over 15 years old is 42,48%(5).

The prevalence of obesity increases at the age of 35 years and over, then decreases again at the age of 60 years and over. In Asia, the majority of obesity basedon BMI is not as high as in the United States or Europe. in Asia, with the same BMI, the risk of metabolic disease is more significant, which may be caused by genetic and environmental factors. Therefore, Asia's BMI threshold differs from the USA or Europe (6). Obesity or high body mass index is one of the factors that cause changes in metabolic parameters (namely. Blood sugar, total cholesterol, uric acid, and blood pressure). Parameters of blood sugar, cholesterol, uric acid, and blood pressure can be related to body mass index.

Many factors affect excess nutrition, including genetic, demographic, and, most critical socio-economic factors. One of the capitals in Indonesia with a high level of economic inequality is DKI, where the poverty rate in the DKI Jakarta province in March 2017 was 6.10%, equivalent to 182,212 people (7). One of the socio-economic impacts is poverty. Poverty is one of the risk factors that affect a person's health. Poverty can also affect access to proper health facilities and healthy food. One of the socio-economic impacts is poverty. Poverty is one of the risk factors that affect a person's health. Also, poverty can affect a person's access to decent health facilities and healthy food.

The integrated guidance post (Posbindu) is one of the government programs for preventing non-communicable diseases (PTM) in the adult population. Activities include weighing BB (Weight), blood pressure examination, blood sugar level examination, cholesterol level examination, and uric acid (8)

In Indonesia, especially Jakarta, research on metabolic parameters and nutritional status in adults in marginal Posbindu areas of PTM has never been conducted. This study aims to determine the relationship of body mass index with metabolic parameters in frontier regions of adults aged 20-75.

OBJECTIVE

The study aimed to examine the relationship between body mass index and instantaneous blood sugar, cholesterol, uric acid, and blood pressure in adults aged 20-75 years in the marginal area of Posbindu PTM Dki Jakarta.

METHOD

Design

This study used a cross-sectional design conducted from July 2020 to August 2020. The information was carried out from secondary data of LKC Research dompet dhuafa.

Sample, Sample Size, & Sampling Technique

The sample in this study was 657 adults aged 20-75 years. The sample was selected from the Dompet Dhuafa LKC Research and met the inclusion criteria. The sample inclusion

criteria included 1) age 20-75 years; 2) checking blood sugar, cholesterol, uric acid, and blood pressure. Then the exclusion criteria used in this study were suffering from severe physical illness, severe communication disorders, and being pregnant.

Ethical consideration

This research has obtained approval and has passed the ethical review issued by *Universitas Esa Unggul*

The instrument for data collection

The data collection tool is a questionnaire to measure sociodemographic data, such as name, gender, address, and age. BMI data was obtained by measuring height (TB) and body weight (BB).BB measurement using digital scales with correction value "0" that has been calibrated by lkc team dompet dhuafa and TB measurement using microtome placed on the wall in posbindu activity, with a position perpendicular to the ceramic floor, with a value of "0" on the floor (9). Blood pressure (systolic and diastolic) is measured using a sphygmomanometer been calibrated by the LKC team. The Easy Touch GCU (glucose, cholesterol, uric acid) tool checks temporary blood sugar (GDS), total cholesterol, and uric acid. Capillary blood sampling punctures the skin on the fingertips (10).

Data Analysis

Statistical analysis in this study used SPSS version 22. Then perform univariate and bivariate analysis using the Spearman correlation test, which aims to determine the relationship between the two quantitative variables. A p-value (P-value) less than 0.05 was considered statistically significant.

RESULTS

Overview of body mass index, blood sugar levels, total cholesterol levels, systolic blood pressure, diastolic and uric acid levels aged 20-30 years

Table 1 showed that 58 respondents that the average body mass index respondents are in the normal range of 23.5 kg / m². The average blood sugar during this study was within normal limits of 108.52 mg/dl. Then in the cholesterol variable, it is known that the average value of cholesterol levels exceeds the standard limit of 203.17 mg/dl, where the normal cholesterol value is <200 mg/dl. It was concluded in the systolic blood pressure variable that the average systolic blood pressure exceeds the normal threshold of 122 mmHg, where the average value of systolic blood pressure is120 mmHg. Then the diastolic blood pressure variable in this study concluded that the average diastolic blood pressure value within the standard limit is 75.55 mmHg. In this study, the uric acid variable concluded that the average uric acid in tilapia was in the normal range of 4.73 mg/dl

Overview of body mass index, blood sugar levels, total cholesterol levels, systolic blood pressure, diastolic and uric acid levels aged 31-49 years

Table 2 showed that 199 respondents can be concluded from 199 respondents that the average body mass index of respondents exceeded the normal of 25.86 kg / m², where the average value is 18.5-25.0 kg / m². The average blood sugar during this study was within the normal limit of 108.52 mg/dl. In the cholesterol, the variable is that the average cholesterol level within the normal limits is 118.21 mg /dl. Then in the systolic blood pressure variable, it is supposed that the average systolic blood pressure exceeds the normal threshold of 123.96 mmHg, where the average systolic blood pressure value is 120 mmHg. Then the diastolic blood pressure variable in this study concluded that the average diastolic blood pressure value within the normal limit is 79.53 mmHg. The variable uric acid in this study concluded that the average tilapia uric acid in the normal range is 5.67 mg/dl.

Overview of body mass index, blood sugar levels , total cholesterol levels, systolic blood pressure, diastolic and uric acid levels aged 50-75 years

From the table above, from the 399 respondents above, it is concluded that the average body mass index of respondents exceeds the normal limit, namely, 25.24 kg / m², where the average value is 18.5-25.0 kg / m². The average blood sugar during this study was within the normal limits, namely 145.04 g

/ dl. Then in the cholesterol variable, the average value of cholesterol level exceeds the value of cholesterol is <200 mg/dl. Then in the systolic blood pressure variable, it is concluded that the average systolic blood pressure exceeds the normal threshold of 134.31 mmHg, and the average systolic blood pressure value is 120 mmHg. Then the diastolic blood pressure variable in this study concluded that the average diastolic blood pressure value within the normal limit is 79.59 mmHg. The variable uric acid in this study concluded that the average uric acid exceeds the normal limit of g / dl.6,05, Where the average uric acid value is 3.4-5.7 mg/dl.

normal limit, 258.79 mg/dl, where the average

Table 1. Overview of body mass index, blood sugar levels, total cholesterol levels, systolic bloodpressure, diastolic and uric acid levels aged 20-30 years

Variable	N	Mean	SD	Minimum	Maximum	Normal
(BMI)	58	23.5	4.185	17	33	18,5-25
blood sugar (GDS)	58	108.52	46.243	76	340	<200
Total cholesterol	58	203.17	36.047	144	290	<200
Systolic blood pressure	58	122.00	15.111	97	154	120
Diastolic blood pressure	58	75.55	8.997	60	96	80
Uric acid	58	4.73	2.321	<3	10	3.4-5.7

Table 2. Overview of body mass index, blood sugar levels, total cholesterol levels, systolic bloodpressure, diastolic and uric acid levels aged 31-49 years

Variable	N	Mean	SD	Minimum	Maximum	Normal
(BMI)	199	25.86	4.873	15	43	18.5-25
blood sugar (GDS)	199	118.21	56.037	70	427	<200
Total cholesterol	199	233.36	77.284	80	400	<200
Systolic blood pressure	199	123.96	16.257	83	169	120
Diastolic blood pressure	199	78.53	10.972	51	107	80
Uric acid	199	5.67	2.056	<3	13	3.4-5.7

Table 3. Overview of body mass index, blood sugar levels, total cholesterol levels, systolic bloodpressure, diastolic and uric acid levels aged 50-75 years

Variable	N	Mean	SD	Minimum	Maximum	Normal
(BMI)	399	25.24	3.972	16	36	18,5-25
blood sugar (GDS)	399	145.04	78.433	70	488	<200
Total cholesterol	399	258.79	73.666	128	400	<200
Systolic blood pressure	399	134.31	19.118	95	200	120
Diastolic blood pressure	399	79,59	10.994	50	118	80
Uric acid	399	6.05	3.695	<3	54	3.4-5.7

Table 4. Relationship of Body Mass Index with Blood Sugar, Total Cholesterol, Systolic Blood Pressure, and Diastolic Blood Pressure in Adults Aged 20-30 years in Posbindu PTM Dki Jakarta Area

Variable	*r value*	*p-value*
blood sugar (GDS)	0.445	0.05
Total cholesterol	0.162	0.226
Systolic blood pressure	-0.195	0.143
Diastolic blood pressure	-0.066	0.063
Uric acid	0.274	0.529

Relationship of Body Mass Index with Blood Sugar, Total Cholesterol, SystolicBlood Pressure, and Diastolic Blood Pressure in Adults Aged 20-30 years in Posbindu PTM Dki Jakarta Area.

The Results of the analysis in table 4 show that in adults aged 20-30 years, thereis a significant relationship between BMI and blood sugar levels in adults aged 20-30 years with a p-value of 0.05 (≤ 0.05) and a ratio value of 0.445 with degrees. The correlation is sufficient, and the direction of the relationship is positive, meaning that the higher the BMI, the higher the results of blood sugar levels.

Based on Heni Parwan's research from 2014, the results showed a link between obesity and blood sugar levels of Madiun Level IV Hospital employees with a p 0.045 (≤ 0.05). A ratio value of 0.319 indicates a low and positively patterned relationship, which means that the higher the body mass index value, the higher the blood sugar level (11).

Dusun Niten Nogotirto Gamping Sleman levels for male and female respondents (p <0.05). High uric acid levels in overweight and obese individuals are caused by overweight individuals who generally have high-fat stores. High-fat storage is often associated with various components of insulin resistance and metabolic syndrome, including the incidence of hypertension, dyslipidemia, and hyperinsulinemia associated with blood uricacid levels. However, the study concluded no significant relationship between BMI and uric acid. In addition to BMI, there was also a factor that caused uric acid, namely purine intake. High purine consumption is more likely to suffer from uric acid than low purine consumption (16).

Relationship between body mass Index with Blood Sugar, Total Cholesterol, Systolic Blood Pressure, and Diastolic Blood Pressure in Adults Aged 31-49 years in Posbindu PTM Dki Jakarta Area.

The bivariate analysis showed no significant relationship between BMI and metabolic parameters in adults aged 31-49 years with a p value> 0.05.

In this study, there was no significant relationship between blood sugar and BMI in adults aged31-49 years (p:> 0.05). The results of this study follow research conducted by Jumaini Andriana in 2018 which said that at productive age, there was no significant relationship between blood sugar and BMI (p: 0.537, p> 0.05). Blood sugar levels at a time do not always affect the incidence of obesity. Based on Sustriani (quoted from Witasari et al. (2009) said that blood glucose levels depend on the activity of hormones released by the glands (namely adrenaline and corticosteroids). Adrenalinewill spur an increase in the need for blood sugar, and corticosteroids will lower blood sugar again. BMI can be used to determine a person's risk of developing metabolic disease. Being Underweight can increase the risk of infectious disease, while being overweight increases the risk of degenerative diseases. Therefore, maintaining anormal body weight allows a person to achieve a longer life expectancy (17).

There is no significant relationship between total cholesterol and BMI in adults aged 31-49. (p-value :> 0.05). This is with the research conducted by Sara Sofia, namely the relationship between body mass index and blood biochemical examination of the employees of PT. Asuransi Jawa Bumi Asih Jakarta says there is no significant relationship between body mass index and total cholesterol. Based on The results of BMI, high cholesterol is not always associated with obesity but is more associated.

The consumption of foods that contain high cholesterol, such as meat, offal, and eggs, increases cholesterol levels in the blood (13). In this study, in Posbindu PTM Dki Jakarta, there was no significant association between BMI and systolic blood pressure in adults aged 31-49. However, this studydoes not correspond to research conducted by Ikhya in 2018, namely that there is a linkbetween systolic and diastolic body mass index and blood pressure (p: 0.01 ≤ 0.05) but with weak relationship strength (15). In this study, there was no significant correlation between uric acid variables in adults aged 31-49 years and BMI (p value> 0.05). This study is not in line with Hariadi's research in 2016, which states that

there is a significant relationship between BMI and uric acid between male and female respondents in the Dusun Niten Nogotirto Gamping Sleman (p <0.05).High uric acid

levels in overweight and obese individuals are caused by overweight individuals who generally have higher fat deposits. High-fat storage is associated with various components of insulin resistance and metabolic syndrome, including hypertension, dyslipidemia, and hyperinsulinemia associated with blood uricacid levels.However, this study concluded no significant relationship between BMI and uric acid. In addition to BMI, some factors caused uric acid, namely purine intake. Compared with the consumption of low levels of purines, high levels of purines have a greater chance of suffering from gout (16).

Table 5. Relationship between variables

Variable	R-value	p-value
blood sugar	0.011	0.873
Total cholesterol	0.111	0.119
Systolic blood pressure	0.088	0.215
Diastolic blood pressure	0.132	0.063
Uric acid	0.045	0.529

Relationship of Body Mass Index with Blood Sugar, Total Cholesterol, Systolic Blood Pressure, and Diastolic Blood Pressure in Adults Aged 50-75 years

Based on the results of the spearmen correlation test in table 3, there is a significant relationship between BMI and blood sugar in adults aged 50-75 yearswith a p-Value value of 0.027 (≤ 0.05). Ratio value - 0.111 with a degree of weak correlation relationship and negative relationship direction means that the higher the BMI,the lower the blood sugar test result.

Table 6. Relationship of Body Mass Index with Blood Sugar, Total Cholesterol, Systolic Blood Pressure, and Diastolic Blood Pressure in Adults Aged 50-75 years

Variable	R-value	p-value
blood sugar (GDS)	-0.111	0.027
Total cholesterol	-0.079	0.114
Systolic blood pressure	0.085	0.091
Diastolic blood pressure	0.42	0.400
Uric acid	0.095	0.057

The results of this study follow Fathmi's research in 2012, regarding the relationship between MT and blood sugar in DM patients, with p <0.001, and the results of this study are also in line with Fatharani's research in 2013 regarding the relationship between BMI and blood glucose levels in obese students with p < 0.001. In adults, BMI results> 25 kg / m2, categorized in the obesity category. Obesity causes an increase in FFA, and FFA accumulates in the target tissue. The accumulation of FFA in the target.

The tissue will result in a decrease in glucose uptake, and glucose will remain in the blood. The remaining glucose in the blood stimulates insulin secretion, and the sensitivity of insulin receptors on the target tissue also decreases. This, in turn, causes insulin resistance and an increase in blood glucose levels (18).

Based on the spearmen correlation test results in this study, there was no significant relationship (p:> 0.05) between the total cholesterol variable and BMI in adultsaged 50-75 years. This is consistent with research conducted by Sara Sofia, entitled the relationship between body mass index and blood biochemistry among employees of PT. Asuransi Jawa Bumi Asih Jaya, Jakarta, concluded that there is no significant relationship between body mass index and total cholesterol levels. From the results based on BMI, obese patients do not always have high cholesterol levels. High cholesterol is not always influenced by obesity. Still, it is more influenced by the consumption of foods that contain lots of cholesterol (such as meat, offal, and eggs which increase cholesterol levels in the blood) (13).

Age also affects the incidence of dyslipidemia. Based on the age group of the elderly, the age group most affected by dyslipidemia is 60-69 years. According to theory and several previous studies, if a person gets older the more at risk of developing dyslipidemia. The risk was higher, but it was not proven significantly in this study because only 18% of subjects over 70 had dyslipidemia. Even though increasing age is a risk factor for dyslipidemia and cannot be modified, it does not mean that prevention efforts cannot be made. Knowing the risk factors you have can make someone more careful in regulating a healthy lifestyle to avoid dyslipidemia (19).

The statistical test results of this study did not find a significant relationship between systolic and diastolic blood pressure (p-value: >0.05) with BMI in adults aged 50-75 years in Posbindu PTM Dki Jakarta. This is by research

evidenced by Vinda in 2019 that there is no relationship between BMI in Posbindu elderly with systolic blood pressure (r = 0.155; p = 0.134) and diastolic blood pressure (r = 0.200; p = 0.052) in elderly Posbindu Maesan Health Center working area. This is because the elderly BMI is in the normal range, and systolic, and diastolic blood pressure is still classified as prehypertensive. Within normal limits, systolic and diastolic blood pressure is still classified as prehypertensive. This is possible because a history of high blood pressure can be passed down to a person genetically (9).

Likewise, the research of Agustina S et al. states that the elderly with a history of hereditary hypertension are 8.8 times more likely to suffer from hypertension than those without a history of genetic hypertension (Guèze and Napitupulu 2016). This result is also in line with the research by Mahampang S et al., which states that most cases of hypertension are influenced by heredity. If both parents have a history of hypertension, their child will be at risk of developing hypertension. This happens because of the genes associated with his decreased hypertension incre(20).

This study has no significant correlation between uric acid and BMI in adults aged 50-75 years (p value> 0.05). This study is not in line with research conducted by Hariadi 2016, showed that male and female respondents had a significant relationship between BMI and uric acid levels in Dusun Niten Nogotirto Gamping Sleman (p <0.05)

Gender is one of the factors associated with increased uric acid levels. Gout tends to be experienced by the male sex because men do not have the estrogen that women have. Estrogen can help remove the uric acid in the urine. Therefore, as long as women have the hormone estrogen, uric acid disposal is also controlled. Still, when women do not have estrogen, such as during menopause, they get gout because uric acid excretion cannot be controlled. If this increase in gout crosses the tolerable threshold, problems will arise first in the kidneys, joints, and urinary tract (21).

The limitation of this study is that it does not categorize the sex of men and women on the relationship between BMI and blood sugar, cholesterol, and blood pressure variables in adults aged 20-75 years.

CONCLUSION

This study found a correlation between BMI and blood sugar at the age of 20-30 years and ages 50-75 years. Then in the 31-49 Year age group, BMI is not correlated with blood sugar, cholesterol, and systolic and diastolic blood pressure. It is suggested for further research to add gender characteristics to see the relationship between BMI and metabolic parameters in the sexes of men and women aged 20-75 years

Acknowledgement

This manuscript has been submitted to the Scientific Article Writing Training (SAWT) Batch IV GREAT 4.1 work program. E, S1 Nutrition Study Program, FIKES, Esa Unggul University with the support of facilitators: Dudung Angkasa, SGZ, M. Gizi, RD; Khairizka Citra Palupi, SGz, MS; along with a team of other Nutrition Science study program lecturers. SAWT Batch IV also received financial support from Esa Unggul University. The author would like to thank LKC Dompet Dhuafa Jakarta Utara for allowing researchers to use LKC Dompet Dhuafa data and all parties involved to complete this research.

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