

RESEARCH ARTICLES

Obesity As Based on Body Mass Index Unrelated to Blood Pressure in Women of Childbearing Age, Age 20–29 Years

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Abstract: Obesity is one of the main risk factors for hypertension. Women of childbearing age are prone to obesity due to an unbalanced diet, low physical activity, and hormonal influences. This study aims to determine the relationship between obesity and blood pressure in women of childbearing age (20–29 years). This study is an analytical descriptive study with a cross-sectional design involving 72 obese women of childbearing age in Medan Deli District, Medan City, North Sumatra Province. Samples were taken purposively, with direct measurements of body weight, height, and blood pressure. BMI is categorised as obesity level I (58.3%) and II (41.7%). The majority of blood pressure was hypertension of the first degree (54.2%), normal (25.0%), and pre-hypertension (20.8%). The Fisher test showed no significant association between obesity and blood pressure ($p = 0.634$). There was no significant association between obesity and blood pressure in women of childbearing age aged 20–29 years. Young age and the possible protective effects of the hormone estrogen, which increases vasodilation through nitric oxide and lowers oxidative stress, are thought to play a role in preventing an increase in blood pressure despite obesity.

Keywords: Blood pressure, obesity, women of childbearing age.

INTRODUCTION

According to the 2018 Riskesdas report, the prevalence of high blood pressure in Indonesians aged ≥ 18 years reached 34.11%, with South Kalimantan Province

reporting the highest rate at 44.13%. Uncontrolled high blood pressure can put an excessive load on the heart and blood vessels, increasing the risk of heart attack, stroke, and various cardiovascular diseases.

Hypertension is one of the leading causes of premature death in the world, affecting more than a billion people, with one in four men and one in five women affected.¹

Obesity is one of the main risk factors for hypertension. Obesity is characterised by an excessive buildup of adipose tissue and is harmful to health. The WHO defines obesity as an abnormal or excessive accumulation of fat that increases the risk of various major health problems, while the American Association of Clinical Endocrinologists (AACE) defines it as a chronic condition. The Body Mass Index (BMI) is used to assess obesity in the adult population, with a BMI of 25 kg/m² or more categorised as obese. Overweight is in the range of BMI of 23–24.9 kg/m², while BMI of 18.5–22.9 kg/m² is considered normal according to the Asia Pacific Criteria^{2,3}

Women of childbearing age (WUS), especially those aged 20–29, have a higher risk of obesity than men. Riskesdas 2018 data shows that the prevalence of obesity in women aged 20–29 years is 39.8%, while men in the same age group are 22.7%. In North Sumatra, the prevalence of obesity in WUS was recorded at 32.8%. In 2021, North Sumatra Province had 1,303,373 WUS, with Medan City ranking first in the province, including Medan Deli District with the highest number of WUS in the 20–29 age group.^{3,4}

Obesity in WUS can increase the risk of hypertension through complex mechanisms, including visceral fat buildup, hormonal changes, activation of the renin-

angiotensin-aldosterone system, insulin resistance, cytokine modulation of adipose tissue, as well as structural and functional changes in the kidneys. In addition to hypertension, obesity in WUS is also associated with preeclampsia, type 2 diabetes mellitus, coronary artery disease, and various other comorbidities. Changes in the hormones estrogen and progesterone can affect body fat distribution, increase visceral fat levels, as well as increase the response to angiotensin II which triggers the secretion of aldosterone, thereby causing sodium and water retention that contributes to increased blood pressure.^{5,6}

Several previous studies on the relationship between BMI and blood pressure in WUS have shown mixed results. Studies conducted in West Java and Medan City reported a significant association between BMI and blood pressure, while other studies, including those conducted in 2023, showed no significant association, especially with diastolic blood pressure. These differences in results indicate the need for further evaluation to understand the effect of obesity on blood pressure in WUS.^{7,8}

This study aims to more clearly assess the relationship between obesity based on BMI and blood pressure in women of childbearing age in the 20–29 years age range, which is expected to be the basis for hypertension prevention and obesity management efforts in this group.

METHOD

This type of research uses an analytical descriptive survey with a cross-sectional research design. This research was carried out in the Medan Deli district, Medan City, North Sumatra Province, in December 2024. The sample of this study is women of childbearing age (WUS) with an age range of 20-29 years who are obese in the Medan Deli district, Medan City, North Sumatra Province, who meet the inclusion and exclusion criteria. Inclusion criteria include women of childbearing age who do not have disabilities or physical disabilities, women who have no history of chronic diseases (heart disease, hypertension, and diabetes mellitus), women who are not pregnant and not under the supervision of a doctor, women who do not use hormonal contraceptives and certain medications such as hyperthyroidism, and women of childbearing age who are obese. Meanwhile, the exclusion criteria include women who find it difficult to measure their weight and height, and women whose blood pressure levels are difficult to measure. Sampling in this study used a purposive sampling technique with a total of 72 samples. Primary data sources were collected directly from the study subjects. In this study, data were obtained through direct measurement of height and weight, then used to determine the value of Body Mass Index (BMI). Furthermore, the respondents' blood pressure was measured using a sphygmomanometer. Data dianalisis menggunakan metode analisis univariat dan

bivariat dengan uji Fisher Exact. Data IMT dan tekanan darah kemudian dianalisis menggunakan *Statistical Product and Service Solutions (SPSS) software*.

RESULT

Table 1. Distribution of Age Range, Obesity, and Blood Pressure

Age Range	Sum (n)	Percentage (%)	Mean
20 - 23	19	26.4	25.19
24 - 26	24	33.3	
27 - 29	29	40.3	
Total	72	100.0	
Body Mass Index	Sum (n)	Percentage (%)	Modus
Obesity Level I	42	58.3	25.71
Obesity Grade II	30	41.7	
Total	72	100.0	
Blood pressure	Jumlah (n)	Persentase (%)	Modus
Normal	18	25.0	100/90
Pre-Hipertensi	15	20.8	
Hipertensi Grade 1	39	54.2	
Hipertensi Grade 2	0	0	
Total	72	100.0	

Based on age, obese WUS 20–29 years old is divided into 20–23 years old 19 people (26.4%), 24 years old (33.3%), and 27 years old 29 people (40.3%), with an average age of 25.19 years. Based on BMI, level I obesity was 42 people (58.3%) and level II was 30 people (41.7%), with a mode of 25.71. Based on blood pressure, normal 19 people (26.4%), pre-hypertension 14 people (19.4%), grade I hypertension 39 people (54.2%), and grade II hypertension 0 people (0%), with a mode of 100/90 mmHg.

Table 2. The Relationship between Obesity and Blood Pressure in Women of Childbearing Age in the Age Range of 20-29 Years Who Are Obese

Body Mass Index	Blood pressure				P value
	Normal	Pre	G2	G2	
	N	n	n	n	
Obesity Level I	12	6	24	0	0.634
Obesity Grade II	6	9	15	0	
Total	18	15	39	0	

From Table 2, it can be seen that the results of Fisher's exact statistical test show a p-value of 0.634, alpha (0.05), which means that there is no significant association between obesity and high blood pressure.

DISCUSSION

In this study, the sample used was 29 women of childbearing age (WUS) aged 27-29 years (40.28%) with an average age of 25 years. In a study conducted by Loretta DiPietro in 2021 in India, the sample used by women of childbearing age (WUS) was 15 to 49 years old (57%) with an average age of 30 years. 16 This study reported that women of childbearing age (WUS) in the age range of 20-29 years experienced obesity. The findings report an alarming global trend, where the prevalence of obesity among young women is increasing. People of productive age tend to be more prone to obesity, which is often caused by unhealthy dietary habits. Consumption of junk food that is high in calories and low in nutrients

contributes to an imbalance between calorie intake and energy expenditure through daily physical activity. As a result, excess calories not balanced with adequate physical activity can lead to fat accumulation in the body, thereby increasing the risk of obesity among individuals in this age group.⁹

In this study, women of childbearing age were in the category of level I obesity more than level II obesity. In a study conducted by Apriyanti et al in 2020 in Kendari reported that women of childbearing age were in the category of Level I Obesity. This data reports a high prevalence of obesity among women of childbearing age. This happens because the lifestyle of women of childbearing age is not well controlled, including excessive diet, fatty food consumption habits, and lack of physical activity¹⁰

In this study, women of childbearing age had the highest blood pressure in the Grade I hypertension category compared to the Grade II hypertension category. Women of childbearing age who were obese with blood pressure in the category of grade II hypertension were not found in this study. In a study conducted by Heni Hendriyani et al. in 2024 in Semarang, it was reported that women of childbearing age are in the hypertensive category. This study does not use blood pressure categories based on JNC 8, but only uses the scale of normal blood pressure and hypertension to simplify classification, adjust to the standards used in previous studies, and make it easier to identify the prevalence of hypertension in

women of childbearing age. Women of childbearing age are physiologically susceptible to hypertension due to various factors such as hormonal changes during the menstrual cycle, pregnancy, and the use of hormonal contraceptives. Pregnancy can trigger conditions such as gestational hypertension or preeclampsia, which increase the risk of chronic hypertension later in life.¹¹

According to this study, there was no meaningful correlation between high blood pressure and obesity. These findings suggest that high blood pressure is not affected by fat. This is consistent with a study conducted in 2023 by Tiara Dahliana Pertiwi et al., which found no association between hypertension and obesity in women of childbearing age. The 2022 study by Ayu Putri Abineno et al. in West Java, which did not find a meaningful correlation between BMI and diastolic blood pressure, is also consistent with this study. Risk factors for hypertension in women of childbearing age can be classified as modifiable and non-modifiable. Irreversible risk factors include genetics, age, gender, and family history. On the other hand, smoking, consuming too much salt or saturated fat, using used cooking oil, drinking alcohol, being obese, not exercising, stressing, and using estrogen are risk factors that can be changed.^{12,13,14}

This study contradicts previous research by Eva Malinti et al. in West Java in 2020, which found a strong correlation between blood pressure and obesity in obese women of reproductive age. Increased blood

pressure due to obesity is caused by a number of complicated processes, such as interdependent hormonal functions, inflammation, and the autonomic nervous system. Blood vessel function is impaired by these mechanisms due to endothelial dysfunction, which ultimately triggers an increase in blood pressure. This study is also not in line with the research conducted by Naufal Jihad Alfalah, et al in 2022 in Padang, which reported that there was a significant relationship between obesity and the incidence of hypertension based on the acquisition of a p-value of 0.000. Obesity can cause hypertension through two main mechanisms, namely direct and indirect. Directly, obesity causes an increase in body mass index (BMI) that exceeds normal limits, thereby increasing the need for blood flow and leading to an increase in cardiac output. Meanwhile, indirectly, obesity stimulates the activity of the renin-angiotensin-aldosterone (RAAS) system, which plays a role in fluid and sodium (Na) retention, thereby increasing stroke volume. In addition, the activity of the sympathetic nervous system is also increased, which is associated with accelerated pulse rate and vasoconstriction, both of which contribute to an increase in blood pressure.^{15,16}

In this study, the results showed that there was no significant relationship between obesity and high blood pressure, possibly because this study used a relatively young sample of women. Physiologically, age influences the incidence of hypertension through several

biological mechanisms that are related to changes in the structure and function of the cardiovascular system. With age, there will be a decrease in the elasticity of blood vessels (arteriosclerosis), so that the resistance of the arteries will increase and consequently increase blood pressure. Kidney function in old age tends to decline, leading to a decrease in the body's ability to manage blood volume and electrolyte balance. Kidneys that are less efficient at regulating sodium and fluids can lead to sodium retention, which increases blood volume and ultimately increases blood pressure.^{17,18}

In the premenopausal period, there is resistance to the development of hypertension, mainly because estrogen increases the bioavailability of NO (nitric oxide) and reduces oxidative stress in the endothelium. Estrogen also lowers the expression of NADPH oxidase, which plays a role in the formation of free radicals^{19,20}

CONCLUSION

Based on the results of the study, it can be concluded that women of childbearing age in the age range of 20–29 years who are obese have an average age of 25.19 years. The majority of respondents were included in the category of level I obesity, with 42 people in Medan Deli District, Medan City, North Sumatra Province. Most women of childbearing age in this age group have blood pressure in the hypertension category, which is as many as 39 respondents. However, no significant

association was found between obesity and blood pressure in women of childbearing age aged 20–29 years. Young age factors and the possible protective effects of the hormone estrogen, which can increase vasodilation through nitric oxide and lower oxidative stress, are thought to play a role in preventing an increase in blood pressure despite obesity.

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