

Original Research Article

CORRELATION BETWEEN BODY FAT PERCENTAGE AND TOTAL CHOLESTEROL LEVELS TO HYPERTENSIVE ELDERLY WOMAN IN MADIUN

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Abstract

Background: Patients with hypertension have twice as great exposed to heart disease and eight times as large as a stroke risk than who do not experience hypertension. Risk increase in blood pressure on the person who has overweight than people with normal weight. Women who have increased cholesterol levels in the blood more vulnerable for hypertension (Nikolov et al., 2015).

Objectives: The purpose of this research aimed to determine a percentage of body fat and cholesterol levels of the elderly women in Posyandu, Geger Subdistrict, Madiun who occurrence of hypertension.

Methods: This research using cross sectional design. The sample using purposive sampling technique with 38 respondent which satisfy the inclusion criteria. Instrument used is Bioelectrical Impedance Analysis tool. Statistical test used is spearman rho with a significance level of $\alpha < 0.05$.

Results: The results of this study showed that significant relationship between body fat percentage and blood pressure (p -value = .033; $r = .304$). Meanwhile, total cholesterol level did not show any relationship with blood pressure (p -value = .429; $r = -.132$).

Conclusion: Fat Accumulation in the kidneys where the renin-angiotensin system is identified in human fat tissue, can cause impaired nephron function which causes blood pressure to rise. Thus, abdominal obesity accompanied by ectopic fat deposits can play an important role in the development of hypertension and should not be neglected when undertaking blood pressure-lowering therapy.

Keywords: *Body fat, cholesterol, elderly women.*

INTRODUCTION

Although treatment of cardiovascular diseases forward rapidly, cardiovascular diseases is still in the first cause of death in Indonesia as a disease. Due to high cost of treatment to a disease that not all people get optimal service. Heart disease risk is twice as great and risks stroke disease and eight times as

large in people with hypertension than a person who is not with hypertension (tian et al., 2011). The World Health Organization [WHO] (2000) put the number of the inhabitants of the world who suffers from hypertension for men about 26.6 % and women about 26.1 % and it is estimated that in the end of 2025 the number will increased to 29.2% (Apriany, 2012).

According to data from 1,003,257 inhabitant of the Province of East Java, the percentage hypertension of 20.43% or approximately 1,828,669 population, with proportions of men of 20.83% (825.412 population) and women of 20.11% (Ministry of Health, 2017). From 191,272 population in Madiun District a person examined, who suffers from hypertension/high blood pressure as much as 85,259 or 44%, with the proportion of men as much as the 34,679 people (39.82%) and the number of women as many as 50,580 people (48.55%) (Madiun Health Office, 2017). Based on the National Health and Nutrition Examination Survey (NHANES) III, the prevalence of hypertension in people who have a BMI > 30 kg/m is 42% in men and 38%. Greater in women than in cases of hypertension in people who have a normal BMI. The risk of increasing blood pressure in people who are overweight is greater than in people of normal weight.

People with hypertension increased cholesterol levels in the blood. In America, research in Framingham heart stated that there is a link between cholesterol levels and blood pressure. American doctors in 2006 has conducted research on data from thousands of women and found that middle-aged women have cholesterol levels high hence more vulnerable. Conversely, in women with high HDL cholesterol levels, the risk of hypertension is lower (Nikolov et al., 2015).

Physicians' health study (2006) compared cholesterol levels in hypertensive men and cholesterol levels in men who had normal blood pressure. The comparison shows the risk of developing hypertension incidence in men with high cholesterol levels is 23% greater than for men with normal cholesterol levels (Harefa, 2009). Amir (2014) explained that generally hypertensive diseases occur along with an increase in high blood cholesterol. Another opinion was also expressed by the World Health Organization, which states that men over the age of 45 and women over the age of 55 will have higher cholesterol levels.

Obesity is a condition in which body had excess fat. Obesity is divided into general

obesity and central obesity. The accumulation of fat is in the abdomen known as central obesity or visceral obesity, which is more related to the incidence of Metabolic Syndrome and heart disease. Waist circumference has been reported to be the main predictor affecting systole and diastole blood pressure in Chinese normoglycemic individuals (Thomas et al, 2000). Furthermore, visceral fat has been linked to the incidence of hypertension in the Population of Japan-Amerika (Hayasi et al, 2003). Since some antihypertensive drugs may affect insulin sensitivity and metabolic risk profile throughout the time, it is very important to examine the correlation of abdominal obesity and blood pressure to prevent confounding factors (Baba and Neugebauer, 1994).

During the preliminary study to the Integrated Post Service (Posyandu) Lansia, Geger Subdistrict, Madiun found a monthly examination history that there were 38 elderly people suffering from Hypertension and the elderly also had cholesterol levels above 200 mmHg. Hypertension is widely associated with high cholesterol levels. On the other hand, there are several other studies that say people with high fat levels tend to suffer from hypertension. So, researchers are interested in researching it in the Elderly. During a visit to the Integrated Post Service (Posyandu) Lansia, researchers also found many elderly people who look overweight. So, from these observations researchers also want to know if there is a correlation of body fat percentage and cholesterol levels to the blood pressure of the Elderly in the Integrated Post Service (Posyandu) Lansia in Geger Madiun.

METHODS

Study Design

The research used observational analytics design with cross-sectional study approach.

Setting

This research was conducted in the Integrated Post Service (Posyandu) Lansia, Geger, Madiun.

Research Subject

Before start the research, researchers first explain the objectives and procedures of this study. After that, the researcher asked for willingness to become a respondent in the form of informed consent. After the respondent stated their willingness in the informed consent form, the respondents that participated in the study conducted physical examinations, anthropometric measurements including height and weight, measurements that are measurements of body fat degrees and measurement of total cholesterol levels This study emphasizes measurement or observation time only once at a time. The population of this study is all women aged 60-74 years in the Integrated Post Service (Posyandu) Geger Madiun. In determining the sample in this study, researchers set several inclusion criteria. The research sample is which satisfies the criteria of inclusion i.e. signing consent informed, becoming a member in the Integrated Post Service (Posyandu) of elderly environment, having a history of hypertension (Systole \geq 140mmHg). The sample in this study were 38 people which satisfies the criteria of inclusion.

Instruments

Instrument in this study used digital scales to measure body fat degrees using Bioelectrical Impedance Analysis (BIA) Tanita BC541 tool. The measurement of total cholesterol levels was carried out by researchers after the respondents had previously been fasted for 8 hours. A total cholesterol test is performed by taking the blood at the respondent's fingertips

and placing it on the cholesterol check stick which will then be measured with the Easy Touch GCU cholesterol gauge.

Data Analysis

After the data is collected the researcher sorts out the research data and does the coding. Data analysis using SPSS version 25. First all data is done normality test with Shapiro wilk test. Bivariate analysis is used to determine the correlation of body fat percentage with blood pressure, total cholesterol levels with blood pressure. The data is tested using the Pearson Correlation test if the data is distributed normally while Spearman test if the data is not distributed abnormally.

Ethical Consideration

During the preparatory phase, a survey of the research site was conducted and the research permit was arranged in the Madiun City Health Office to conduct research at the Public Health Center of Geger. This study was approved by the Public Health Center of Geger 072/7044/436.72/2018. Before doing measurement to respondents, researchers first explain the objectives and procedures of this study. Researchers explained to prospective respondents that the data collection of this study was only using a digital scale and cholesterol check stick and no treatment would harm the respondent. The researcher also explained that all respondents' personal data obtained in this study would be guaranteed confidentiality, for example the name and address of the respondent.

RESULTS

Characteristics of Respondents

Table 1. Distribution of Respondents in the Integrated Post Service (Posyandu) of Elderly at Geger Sub-District, Madiun District, East Java, Indonesia.

Characteristics of Respondents	Frequency (f)	Percentage (%)
Age (Years)		
60-65	11	28.95
66-70	27	71.05

Characteristics of Respondents	Frequency (f)	Percentage (%)
Job		
Farmer	27	71.05
Entrepreneurials	4	10.52
Housewives	7	18.42
Body Mass Index		
Less	1	2.63
Normal	13	34.21
Obesity Risk	8	21.05
Obesity 1	16	42.10
Exercises		
Yes	0	0.00
No	38	100.00
Salt Use		
Yes	38	100.00
No	0	0.00
Family History of Hypertension		
Yes	17	44.73
No	21	55.26

Sources: Primary Data of Questionnaires, 2019.

The results of this study obtained that the majority of respondents are 66-70 years old and work as a farmer as many as 27 respondents (71.05%). Most of the respondents had body mass index status on obesity 1 as many as 16 respondents (42.10%). All respondents have

the habit of not doing exercises and consuming salt. Most of the respondents did not have a family health history in the form of hypertension as many as 21 respondents (55.26%).

Characteristics of Respondents by Body Fat Percentage

Table 2. Distribution of Respondents by Body Fat Percentage in the Integrated Post Service (Posyandu) of Elderly at Geger Sub-District, Madiun District, East Java, Indonesia.

Criteria	Frequency (f)	Percentage (%)
Less < 24%	0	0.00
Normal 24% - 36%	29	76.31
High 36% - 42%	9	23.68
Very High > 42%	0	0.00

Sources: Primary Data of Questionnaires, 2019.

From the results of measurements of elderly body fat, most of the 76.31% had normal body fat levels and the rest in the high category was 23.68%. Since a person is 30

years old there will be a 2% increase in body fat per year, this increase in subcutaneous fat deposited in the body.

*Characteristics of Respondents by the Total Cholesterol Level***Table 3.** Distribution of Respondents by the Total Cholesterol Level in the Integrated Post Service (Posyandu) of Elderly at Geger Sub-District, Madiun District, East Java, Indonesia.

Criteria	Frequency (f)	Percentage (%)
Normal < 200 mg/dL	0	0
High Borderline 200-239 mg/dL	15	39.47
High \geq 240 mg/dL	23	60.52

Sources: Primary Data of Questionnaires, 2019.

From the table above obtained that all elderly respondents have above normal cholesterol levels or more than 200 mm/dL.

More than half of those 60.52% fall into the category of high cholesterol or hypercholesterolemia.

*Characteristic of Respondents by Blood Pressure***Table 4.** Distribution of Respondents by Blood Pressure in the Integrated Post Service (Posyandu) of Elderly at Geger Sub-District, Madiun District, East Java, Indonesia.

Criteria	Frequency (f)	Percentage (%)
Normal	0	0.00
Hypertension degree 1 (140-159/90-99mmHg)	20	52.63
Hypertension degree 2 (160-179/100-109mmHg)	18	47.36
Hypertension degree 3 (\geq 180/110mmHg)	0	0.00

Sources: Primary Data of Questionnaires, 2019.

The results of this research on the table above obtained that the 38 Elderly respondents who suffered from Hypertension, 47.36% suffered from degree 2 hypertension and the remaining 52.63% were mild degree hypertension. Age is one of the factors that

affects blood pressure. Age is associated with the incidence of high blood pressure (hypertension). The risk of developing hypertension will increase with the older a person (Khomsan, 2003).

*Analysis of the Relationship between Total Cholesterol Level and Blood Pressure Level***Table 5.** Analysis of the Relationship between Total Cholesterol Level and Blood Level in the Integrated Post Service (Posyandu) of Elderly at Geger Sub-District, Madiun District, East Java, Indonesia using Spearman Rho Test.

Cholesterol level	Blood Pressure			Total
	Hypertension degree 1 (140-159/90-99 mmHg)	Hypertension degree 2 (160-179/100-109 mmHg)	Hypertension degree 3 (\geq 180/110 mmHg)	
Normal < 200 mg/dL	0	0	0	0
High Borderline 200-239 mg/dL	6	9	0	15
High \geq 240 mg/dL	14	9	0	23
Total	20	18	0	38

 p -value = .429; r = -.132

Sources: Primary Data of Questionnaires, 2019.

The study was analyzed using the Spearman rho test using a degree of meaning $\alpha < 0.05$. Of the 38 respondents obtained p -value = 0.429 so that p -value $> \alpha$ means H_0 is

accepted, it can be said that there is no significant correlation between elderly cholesterol levels and elderly blood pressure in Posyandu, Geger Subdistrict, Madiun.

Analysis of the Relationship between Body Fat Percentage and Blood Pressure Level

Table 6. Analysis of the Relationship between Body Fat Percentage and Blood Level in the Integrated Post Service (Posyandu) of Elderly at Geger Sub-District, Madiun District, East Java, Indonesia using Spearman Rho Test.

Body fat levels	Blood Pressure			Total
	Hypertension degree 1 (140-159/90-99 mmHg)	Hypertension degree 2 (160-179/100-109 mmHg)	Hypertension degree 3 ($\geq 180/110$ mmHg)	
Normal 24%-36%	12	17	0	29
High 36%-42%	3	6	0	9
Very High $>42\%$	0	0	0	0
Total	15	23	0	38

p -value = .033; $r = .304$

Sources: Primary Data of Questionnaires, 2019.

The study was analyzed using the Spearman rho test using a degree of meaning $\alpha < 0.05$ (table 6). From the 38 respondents obtained p -value = 0.033 so that p -value $< \alpha$ means H_0 rejected and H_1 accepted, it can be sensed that there is a significant correlation between body fat levels and elderly blood pressure in Posyandu, Geger Subdistrict, Madiun.

DISCUSSION

Correlation between Total Cholesterol Levels and Blood Pressure on Hypertensive Elderly Women in Madiun

Based on cross-tabulation and statistical tests of respondents based on cholesterol levels and blood pressure of women in Posyandu, Geger Subdistrict, Madiun showed as many as 15 elderlies who had cholesterol levels of 200-239 mm/dl had hypertension degrees 1 and 2. While the rest of the 23 elderlies with total cholesterol levels above 240 mm /dl have hypertension degrees 1 and 2 with the number of hypertension degrees 1 more. These results were then analyzed using spearman rho test and obtained p value = 0.429 so p value $> \alpha$ (0.05) which means that there is no significant

correlation between elderly cholesterol levels and existing elderly blood pressure in Posyandu, Geger Subdistrict, Madiun.

Risk factors that because hypertension include age, genetics, gender, consumption of kitchen salt and smoking (Gray, et al., 2012). In the study known the characteristics of the respondent's age were in the range of 60-74 years. The results of the study are also in line with the theory that the longer the cholesterol in the blood will get thicker. The increase in age that occurs will lead to thickening that occurs will also be more and more (Gray, et al, 2012). People with old age usually have cholesterol whose levels are more than the normal range so have a greater risk of developing hypertension. Hasurungan quoted in Lutfi (2019), stated that in the age range of 55- 59 years there will be an increased risk of hypertensive by 2.18 times compared to the age of 60-64 years, the age of 65-69 years has 2.45 times and the age of more than 70 years increases by 2.97 times. This can be caused by the age that the large arteries become stiff due to the loss of flexibility so that the blood flow at each heart rate is forced to go through narrower blood vessels than usual

which can be the cause of rising blood pressure (Sigarlaki, 2006).

Hypercholesterolemia can occur due to many factors. Judging by genetic factors in polygenic hypercholesterolemia and familial hypercholesterolemia, hypercholesterolemia can also be caused by secondary factors resulting from other diseases such as nephrotic syndrome, diabetes mellitus as well as overweight factors, diet consuming saturated fats, less physical activity, smoking as well as age. It can be concluded, the data from this study shows the percentage of elderly respondents has a high cholesterol level (≥ 240 mg/dl) of 60.52% or as many as 23 people. This is in accordance with Gray's theory (2005) which explains that cholesterol in the blood will thicken over time. The older a person gets, the more cholesterol plaque there will be. People with old age tend to have higher cholesterol levels so the risk of hypercholesterolemia will also be greater. The results showed that respondents had a family history of hypertension of 44.73% or 17 respondents. The association of hypertension with genetics can be explained through several studies that say that abnormalities in the angiotensinogen gene have a link to the onset of hypertension genetically whose mechanism is likely polygenic (Gray, et al., 2012).

In this study, there was no correlation between cholesterol levels and blood pressure. Phallus (2012) explains that not all hypercholesterolemia sufferers have high blood pressure and vice versa not all hypertension sufferers have high cholesterol levels, but high blood cholesterol levels will result in elevated blood pressure. Singalingging (2011) also explained that the average female will be at risk of increased blood pressure (hypertension) after entering the menopause mass which is over the age of 45 years. This occurs due to the role of estrogen hormones that can increase levels of High-Density Lipoprotein (HDL). In women with advanced age will have a greater risk of experiencing hypertension. The sensitivity to food and stress experienced by elderly women leads to an increased risk of hypertension.

Therefore, hypertension occurs more in women than men who are equally elderly (Lanny, 2012). The results of Bintanah's research (2010) show that the majority (76.5%) respondents suffering from hypercholesterolemia had a history of high fat intake. The types of fat intake consumed include the most ari innards, condensed coconut milk, fatty meats and coconut oil. People who have a high risk of cholesterol levels are those who consume foods that contain high saturated fats. It can increase levels of Low-Density Lipoprotein (LDL) in the blood. Thus, high blood cholesterol levels are not always a direct cause of high blood pressure due to the rise in blood pressure can also be caused by several factors such as: obesity, diet, stress, age, occupation, education and others.

Correlation Between Body Fat Percentages and Blood Pressure on Hypertensive Elderly Women in Madiun

Based on cross tabulation results and statistical tests of respondents based on body fat levels and blood pressure of women in Posyandu, Geger Subdistrict, Madiun obtained data that 29 respondents who had normal fat levels, 17 of whom had high blood pressure of 2 degrees. While 9 respondents had high fat levels, 6 respondents suffered from 2-degree hypertension. The amount of fat in the elderly tends to be more than at a young age. The amount of fat in young adult men is generally lower than that of adult women which only ranges from 15-20% of the total body weight compared to women who reach 20-25% of the total body weight. In women who have entered menopause, there tends to be an increase in cholesterol levels in the blood due to the formation of the hormone estrogen.

Body composition is one of the important components that affects an individual's health. Although changes in the number of body components will affect a person's health, body fat becomes the body component that most affects an individual's health both short-term and long-term (Pulgaron, 2013). The definition of body fat is body composition in addition to

body water content, bone mass and muscle mass. Percent body fat is described as a condition of weight or fat mass that exists in a person's body in general which includes subcutaneous and visceral fat (Tri, 2019). Fat levels that make up the human body are usually measured in Percentage (Jansen, 2016 dalam Santika, 2016). The amount of body fat content between women and men is certainly much different. More fat cells in women are caused by different posture, hormonal and bodily functions when compared to men (Jansen, 2016 on Santika, 2016).

Saturated fat is a fat that contains a lot of cholesterol and this type of cholesterol easily makes plaque so that it can make blood vessels narrow and result in circulatory disorders. Many factors lead to the cause of hypercholesterolemia. The weight gain of a person then the size of fat cells will also increase in size and the number increases a lot (Sugondo, 2009). Physical activity is also factoring that can lower cholesterol levels. From the characteristics of respondents, it is known that all respondents do not exercise. This is because in Posyandu, Geger Subdistrict, Madiun also has no programs such as Elderly gymnastics. In fact, this was once done but did not run and did not continue until now. Whereas by doing regular physical activity we can lower cholesterol levels in the blood. In addition to physical activity, weight stability is also associated with cholesterol levels. Of the characteristics of BMI, 63.15% or 24 of the 38 respondents had more BMI than normal. The risk of hypertension will increase in those who are overweight above 30% as well as consume kitchen salt, smoke, and do not exercise (Suharto, 2004).

Statistical analysis tests on this study state that there is a significant correlation between body fat percentage and total cholesterol levels. This is in accordance with research conducted by Ramadhani (2017) that there is a correlation between BMI with systolic and diastolic blood pressure (p value = $0.000 < 0.05$) and (p value = $0.002 < 0.05$), in patients with inpatient hypertension in the hospital. Roemani

Muhammadiyah Semarang. Another study conducted by Fathina (2007) explained that there is a significant correlation ($p=0,00$) between fat intake and hypertension, increased fat intake in line with increased systolic and diastolic blood pressure. This is because dietary patterns in consuming fats, especially saturated fats, are very closely related to weight gain and have a risk of hypertension. Consumption of saturated fats can also increase the risk of atherosclerosis associated with blood pressure. According to research conducted by Sugiharto (2007) in Karanganyar that shows a significant link between fat consumption and increased diastolic blood pressure is evidenced by a value of $p=0.024$ (Hamzah, 2019).

The age the number of body fat is increased. In men approaching the age of 50 and in women approaching 65 years will there be an increase in the prevalence of obesity. The amount of body fat will increase both in absolute and total weight percentage as part of the aging process. Some studies in developing countries provide evidence that body fat improved significantly over the age of 30, especially women who experience the pregnancy process so that at their weight will tend to increase. Of course, this is also followed by increasing piles of fat tissue. So, it will further impact the accumulation of free fatty acids in the body which is increasing. According to Villareal (2005), in relation to age, there will be an increase in fatty acids starting after the age of 20 years. This is due to the increasing age of a person which leads to a decrease in Total Energy Expenditure (TEE). In each decade of a person's age, body fat mass will also change towards increasing especially occurring after the age of 20 years. A meta research analysis, to increase the level of good cholesterol High Density Lipoprotein by 0.35 mg/dl then the weight should be lowered. This weight loss leads to increased esterification and transport of cholesterol back to the liver. Excess activation of the sympathetic nerve and renin-angiotensin system and increased levels of inflammatory pathways are also some physiological changes that may explain the

relationship of excess weight and increased blood pressure (Dauche, 2007). While according to Marliani (2007) hypertensive patients are mostly overweight, but that does not mean that people who are normal weight cannot suffer from hypertension.

Components of the renin-angiotensin system have been identified in human adipose tissue (Zorad, 1995). Obesity is also known to cause alterations of the alterations of the alterations of the kidneys over time causing the nephron to lose its function and may increase (further elevation) of blood pressure (Kopelman, et al., 2010). According to him, fat deposition in the kidneys measured through CT shows predictions of hypertension in substudy imaging in the Framingham Heart Study, this discovery provides another possibility in explaining the relationship between visceral fat, ectopic fat deposition, and blood pressure settings (Foster, et al., 2011). Thus, abdominal obesity accompanied by ectopic fat deposits, seems to play an important role in the onevention of hypertension and should not be ignored when performing blood pressure reduction therapy.

CONCLUSION

Based on the results of the above research, it was found that there was a relationship between body fat percentage and blood pressure in elderly women. Therefore, elderly women must be careful about body fat so that their blood pressure is controlled.

SUGGESTIONS

With the results of this study, it is hoped that elderly women can control their body fat percentage by living a healthy life (regular exercise, avoiding excessive fat consumption, etc.). Besides that, you also have to do routine health checks. Health workers must also help elderly women by providing information related to diet, exercise, and how to control body fat.

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DECLARATION OF CONFLICTING INTEREST

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AUTHOR CONTRIBUTION

Binar Wahyuning Widhi: Compile article and analyze research data.

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