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

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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). **Objective:** The purpose of this research is 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:** Spearman test between the body fat and blood pressure elderly show results p value = 0,033 ($<\alpha$ 0.05) With a correlation coefficient r = 0,304 which means a significant relation exists between levels of body fat with blood pressure in moderate closeness. **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 (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 the and women of 20,11 % (Ministry of Health, 2017) . From 191.272 Madiun district population 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 normoglikemic 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 in Posyandu, 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 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 integrated post service (posyandu) Lansia in Geger Madiun.

METHODS

Study Design
This type of research is observational analytics with cross sectional study design.

Setting
Survey of the research site was conducted in May 2019 and was conducted in Posyandu 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 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 elderly posyandu environment, having a history of hypertension (Sistole ≥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
Description of Sample Characteristics

Table 1. Distribution based on characteristics of respondents in Posyandu Geger, Madiun

No	Criteria	Frequency	Percentage
1	Age of respondents		
	60-65	11	28,94
	66-70	27	71,05
2	Job		
	Farmer	27	71,05
	Entrepreneurials	4	10,52
	Housewives	7	18,42
3	Body mass index		
	Less	1	2,63
	Normal	13	34,21
	Obesity Risk	8	21,05
	Obesity 1	16	42,10
4	Exercises		
	Yes	0	0
	No	38	100
5	Salt Use		
	Yes	38	100
	No	0	0
6	Family history of hypertension		
	Yes	17	44,73
	No	21	55,26

From the results of the study, 24 respondents had more body time index than normal. 16 of them belonged to the category of 1 degree obesity and received a presentation of 42.10%.

Description of Body Fat Percentages

Table 2. Distribution of Body fat percentaes on elderly women in Posyandu Geger,Madiun

Criteria	Frequency	Percentage (%)
Less < 24%	0	0
Normal 24%-36%	29	76,31
High 36%-42%	9	23,68
Very High >42%	0	0

Source: Primary Data of Body Fat Percentages on Elderly Women in Madiun, 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.

Description of Cholesterol Levels

Table 3. Distribution of total cholesterol levels on elderly women in Posyandu Geger, Madiun

Criteria	Frequency	Percentage (%)
Normal < 200 mg/dL	0	0
High Borderline 200-239 mg/dL	15	39,47
High ≥ 240 mg/dL	23	60,52

Source: Primary Data of Total Cholesterol levels on Elderly Women in Madiun, 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.

Description of Blood Pressure

Table 4. Distribution of Blood Pressure on elderly women in Posyandu Geger,Madiun

Criteria	Frequency	Percentage (%)
Normal	0	0
Hypertension degree 1 (140-159/90-99mmHg)	20	52,63
Hypertension degree 2 (160-179/100-109mmHg)	18	47,36
Hypertension degree 3 (≥180/110mmHg)	0	0

Source: Primary Data of Blood Pressure on Elderly Women in Madiun, 2019

Of 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 Cholesterol and Blood Pressure Levels

Table 5. Cross-Tabulation and Statistical Test Results of Respondents Based on Total Cholesterol level and Blood Pressure Levels on Elderly Women in Posyandu Geger,Madiun

No	Cholesterol level	Blood Pressure			Total	Statistical Test
		Hypertension degree 1 (140-159/90-99 mmHg)	Hypertension degree 2 (160-179/100-109mmHg)	Hypertension degree 3 (≥180/ 110 mmHg)		
1	Normal < 200 mg/dL	0	0	0	0	P value 0,429 r -.132
2	High Borderline 200-239 mg/dL	6	9	0	15	
3	High≥ 240 mg/dL	14	9	0	23	
	Total	20	18	0	38	

The study was analyzed using the Spearman rho test using a degree of meaning α=0.05. Of the 38 respondents obtained p value= 0.429 so that p value > α means H0 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 Body Fat and Blood Pressure Levels

Table 6. Cross Tabulation and Statistical Test Results of Respondents Based On Body Fat Percentage and Blood Pressure Levels on Elderly Women in Posyandu Geger Madiun

No	Body fat levels	Blood Pressure			Total	Stastical Test
		Hypertension degree 1 (140-159/90-99mmHg)	Hypertension degree 2 (160-179/100-109mmHg)	Hypertension degree 3 (≥180/110 mmHg)		
1	Normal 24%-36%	12	17	0	29	P value 0,033 r .304
2	High 36%-42%	3	6	0	9	
3	Very High >42%	0	0	0	0	
	Total	15	23	0	38	

The study was analyzed using the Spearman rho test using a degree of meaning α=0.05. From the 38 respondents obtained p value= 0.033 so that p value < α means H0 rejected and H1 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 elderies who had cholesterol levels of 200-239 mm/dl had hypertension degrees 1 and 2. While the rest of the 23 elderies 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 > α (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 cause 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 hyperthesis 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 onion 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 menopouse 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 menopouse, there tends to be an increase in cholesterol levels in the blood due to the in 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 dalam 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 onscing 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 activty are also factors 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 andstolic 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 Villlareal (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 Hight 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 subtudy 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 research by conclusions may be drawn as follows :

1. The body mass index of elderly women in Posyandu, Geger Subdistrict, Madiun is higher than normal which is 63.15% and has a high body fat levels of 23.69%

2. A total of 38 elderly female respondents women in Posyandu Geger Subdistrict has a high blood pressure more than 140mmHg (Diastole) as well as cholesterol levels above normal (200mm/dL).

3. Spearman test results between total cholesterol and elderly blood pressure in Posyandu, Geger Subdistrict, Madiun showed p value= 0.429 and correlation coefficient r=0.132 which means there is no significant correlation between total cholesterol levels and blood pressure.

4. Spearman test results between body fat and elderly blood pressure in Posyandu, Geger Subdistrict, Madiun showed p value=0.033 (< α 0.05) and correlation coefficient r= 0.304 which means there is a significant correlation between body fat levels and blood pressure with moderate closeness.

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There is no conflict of interest in this research.

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AUTHOR CONTRIBUTION

Binar Wahyuning Widhi :

Compile article and analyze research data

Mega Arianti Putri :

Perform data and compile article

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REFERENCES

Anggraini, AD., Waren, S., Situmorang, E., Asputra, H., dan Siahaan, SS. (2009). Faktor--Faktor Yang Berhubungan Dengan Kejadian Hipertensi Pada Pasien Yang Berobat Di Poliklinik Dewasa Puskesmas Bangkinang Periode Januari Sampai Juni 2008. Fakultas Kesehatan. Universitas Riau. Files of DrsMed-FK UNRI : 1-41

Apriany, R. E. (2012). Asupan Protein, Lemak Jenuh, Natrium, Serat Dan IMT Terkait Dengan Tekanan Darah Pasien Hipertensi Di RSUD TUGUREJO SEMARANG. *Journal of Nutrition College*, 1, 21-29. DOI: 10.14710/jnc.v1i1.737

Baba T, Neugebauer S. (1994). The link between insulin resistance and hypertension. Effects of antihypertensive and antihyperlipidaemic drugs on insulin sensitivity. *Drugs*, 383–404. DOI: 10.2165/00003495-199447030-00002

Bintanah, S. (2010). Hubungan Konsumsi Lemak dengan Kejadian Hiperkolesterolemia di Poli Klinik Jantung Rumah Sakit Umum Daerah Kraton Kabupaten Pekalongan. *Jurnal Kesehatan Masyarakat*, 6, 85-90. DOI: : 10.26714/jkmi.6.1.2010.%p

Ramadhani, Dewi Harsuci., Bintanah, Sufiati & Handarsari, Erma .(2017). Profil Tekanan Darah Berdasarkan Asupan Lemak, Serat dan IMT Pasien Hipertensi. *Jurnal Gizi*, 6, 55-59. DOI: https://doi.org/10.26714/jg.6.2.2017.%25p

Elizabeth R.Pulgaron, Alan M. Delamater, Amber Daige. (2013). *Obesity in Adolesence*. *Handbook of Adolescent Health Psychology*. Verlag New York: Springer Pulisher. Tersedia dari Springer

Jalal, Fasli., Liputo, Nur Indrawaty., Susanti, Novia & Oenzil, Fadil. (2008). Lingkar Pinggang, Kadar Glukosa Darah, Trigliserida dan Tekanan Darah pada Etnis Minang di Kabupaten Padang Pariaman, Sumatera Barat. *Media Medika Indonesia*, 43, 129-137.

Foster MC, Hwang SJ, Porter SA, Massaro JM, Hoffmann U, Fox CS. (2011). Fatty kidney, hypertension,and chronic kidney disease: the Framingham Heart Study. *Hypertension*, 58, 784–790. DOI: https://doi.org/10.1161/HYPERTEN SIONAHA.111.175315

Gray. K, S. K. Bansal, V. Saxena, S. D. Kandpal, W. K. Gray, R. W. Walker, and D. Goel.(2012). The prevalence of hypertension and hypertension risk factors in a rural Indian community: a prospective door-to-door study. *Journal of Cardiovascular Disease Research*, 3, 117–123. DOI: 10.4103/0975-3583.95365

Garrows JS, James WPT, Garrows, JS, (2000). *Human nutrition and dietetics*. London: Churchill Livingstone. Diakses dari Wiley InterScience Database

Hamzah Alif, Khasanah Uswatun, Norviatin Dini. (2019). The Correlation of Age, Gender, Heredity, Smoking Habit, Obesity, and Salt Consumption with Hypertension Grade in Cirebon, Indonesia. *Global Health Manajemen Journal*, 3(3), 138-145. DOI: 10.35898/ghmj-33457

Lutfi , dkk. (2020). Hubungan Antara Diet Tinggi Serat dengan Derajat Hipertensi pada Lansia di Wilayah Kerja Puskesmas Kecamatan Bangkalan. *Nursing Update*. *Jurnal Ilmiah Keperwatan*. 11, 7-15.

Hayashi, T, Boyko EJ ,Leonetti DL, Mc Neely MJ, Newell-Morris L, Kahn SE, Fujimoto WY. (2003). Visceral adiposity and the prevalence of hypertension in Japanese Americans. *Circulation*, 108, 1718–1723. DOI: 10.1161/01.CIR.0000087597.59169. 8D

Santika. (2016). Pengukuran Tingkat Kadar Lemak Tubuh Melalui Jogging Selama 30 Menit Mahasiswa Putra Semester IV POK IKIP PGRI Bali Tahun 2016. *Jurnal Pendidikan Kesehatan Rekreasi*, 2, 89-98.

Kopelman PG,Caterson ID,Dietz WH. (2008). *Clinical Obesityin Adultsand Children* (2nd.). Chichester, UK: Wiley-Blackwell. Diakses dari Wiley InterScience Database

Lanny Sustrani, Syamsir Alam, Iwan Hadibroto. (2004). *Hipertensi*. Jakarta: PT Gramedia Pustaka Utama

Lestari, Tina Widiyatul. (2015). Hubungan Kadar Kolesterol dengan Tekanan

Darah pada Pra Lansia Hipertensi Di Posyandu Lansia Dusun Jetis Bantul Yogyakarta. Skripsi. http://digilib.unisayogya.ac.id/161/1/NASKAH%20PUBLIKASI.pdf (diakses 28 Juni 2020)

Lingga, L., (2012). *Bebas Hipertensi Tanpa Obat*. Jakarta: Agro Media Pustaka.

Marliani L, dkk. (2007). *100 Question & Answers Hipertensi*. Jakarta : PT Elex Media Komputindo, Gramedia.

Maryati Heni. (2017). Hubungan Kadar Kolesterol Dengan Tekanan Darah Penderita Hipertensi di Dusun Sidomulya Desa Rejoagung Kecamatan Ploso Kabupaten Jombang. *Jurnal Keperawa* 8, 127-137. DOI: https://doi.org/10.22219/jk.v8i2%20Jul

Novitaningtyas, Tri. (2014). Hubungan Karakteristik (Umur, Jenis Kelamin,Tingkat Pendidikan) dan Aktifitas Fisik dengan Tekanan Darah Pada Lansia Di Kelurahan Makam Haji Kecamatan Kertasura Kabupaten Sukoharjo. Program Studi Gizi Fakultas Ilmu Kesehatan Universitas Muhammadiyah Surakarta. Skripsi. http://eprints.ums.ac.id/29084/9/02._Naskah_Publikasi.pdf. (diakses 28 Juni 2020)

Dinas Kesehatan Kota Madiun. (2018). Profil Kesehatan Kota Madiun 2017. http://dinkes.madiunkota.go.id/wp-content/uploads/2018/10/PROFIL-KESEHATAN-2017.pdf (diakses 5 juli 2020)

Dinas Kesehatan Jawa Timur. (2018). Profil Kesehatan Provinsi Jawa Timur 2017 http://www.depkes.go.id/resources/download/profil/PROFIL_KES_PROVINSI_2017/15_Jatim_2017.pdf. (Diakses 5 Juli 2019)

Pulgarón ER.(2013). Childhood Obesity: A Review of Increased Risk for Physical and Psychological Comorbidities. *Clininical Therapeutics*, 35, 18–32. DOI:https://doi.org/10.1016/j.clinthera.2012.12.014

Rahajeng, E., Tuminah, S. (2009). Prevalensi Hipertensi dan Determinannya di Indonesia. *Majalah Kedokteran Indonesia*, 59(12), 580- 587

Ribeiro SML, Kehayias JJ. (2014). Sarcopenia and the Analysis of Body Composition. *Advances In Nutrition .American Society for Nutrition*, 5(3), 260 – 267. DOI: 10.3945/an.113.005256

Sigarlaki, HJO. (2006). Karakteristik Dan Faktor Berhubungan Dengan Hipertensi Di Desa Bocor, Kecamatan Bulus Pesantren, Kabupaten Kebumen, Jawa Tengah. *Makara Kesehatan*. 10 (2): 78-88

Singalingging, G. (2011). Karakteristik Penderita Hipertensi Di Rumah Sakit Umum Herna Medan. *Jurnal Onlie Mahasiswa*,5(2).1-6.

Soegondo, S., (2009). *Sindroma Metabolik*. In: Sudoyo, A.W., Setiyohadi, B., Alwi, I., Simadibrata, M., Setiasti, S., editors. *Buku Ilmu Penyakit Dalam* Jilid 3. 5th ed. Jakarta: Departemen Ilmu Penyakit Dalam Fakultas Kedokteran Universitas Indonesia (pp 1865).

Sugondo, S., (2009). *Obesitas*. In: Sudoyo, A.W., Setiyohadi, B., Alwi, I., Simadibrata, M., Setiasti, S., editors. *Buku Ilmu Penyakit Dalam* Jilid 3. 5th ed. Jakarta: Departemen Ilmu Penyakit Dalam Fakultas Kedokteran Universitas Indonesia (pp 1973).

Soeharto, I., (2004). *Kolesterol dan Lemak Jahat, Kolesterol dan Lemak Baik dan Proses Terjadinya Serangan Jantung dan Stroke*. Jakarta: PT Gramedia Pustaka Utama, (pp. 28-31, 44-79, 90-9, 101-7, 154-69).

Tchernof, André and Després, Jean-Pierre. (2011). Pathophysiology Of Human Visceral Obesity: An Update. *Jurnal Physiol*, 93, 359–404.

Thomas GN, Critchley JA, Tomlinson B, Anderson PJ, Lee ZS, Chan JC. (2000). Obesity, independent of insulin resistance, is a major determinant of blood pressure in normoglycemic Hong Kong Chinese. *Metabolism*, 49,1523–1528.

Ully Aquarilia Fathina. 2007. Hubungan Asupan Sumber Lemak dan Indek Massa Tubuh (IMT) dengan Tekanan Darah Pada Penderita Hipertensi. Undergraduate Thesis, Program Studi Ilmu Gizi .UNDIP. (diakses 28 juni 2019)

Villareal DT, Apovian CM, Kushner RF, Klein S. (2005). Obesity in older adults: technical review and position statement of the American Society for Nutrition and NAASO, The Obesity Society. *American Journal of Clinical Nutrition*. 82, 923-34.

Zorad S, Fickova M, Zelezna B, Macho L, Kral JG. (1995). The role of angiotensin II and its receptors in regulation of adipose tissue metabolism and cellularity. *Gen Physiol Biophys*,14, 383–391.

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