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The Correlation Age and Body Mass Index (BMI) Score with Blood Pressure in Hypertension Patient

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ABSTRACT

Hypertension is a condition where the blood vessels have high blood pressure against the pressure of the artery walls when the blood is pumped by the heart throughout the body. The higher the blood pressure, the harder the heart works. The risk of hypertension with a BMI is two to three times higher than that of a normal or thin body weight. This study aims to determine the relationship between age and body mass index (BMI) score with blood pressure in hypertensive patients. Correlation research design with a cross sectional approach on 1-31 August 2023. The population of all hypertensive patients in the Seruni Room at Dolopo Hospital is 35 patients with a sample size of 35 respondents. Sampling uses Accidental Sampling. Independent variables: Age using a questionnaire and Body Mass Index (BMI) using a weight and height observation sheet and the dependent variable Blood Pressure using a Blood Pressure Observation Sheet. The results of the Pearson product moment test show that the p value for age and systolic blood pressure is 0.000 and the Pearson correlation is 0.659, so there is a strong relationship between age and systolic blood pressure in hypertensive patients. The results of the Pearson product moment test show that the p value for age and diastolic blood pressure is 0.000 and the Pearson correlation is 0.647, so there is a strong relationship between age and diastolic blood pressure in hypertensive patients. The results of the Pearson product moment test show that the p value of the BMI score with systolic blood pressure is 0.003 and the Pearson correlation is 0.483, so there is a relationship between BMI score and systolic blood pressure in hypertensive patients with a moderate relationship. the results of the Pearson product moment test show that the p value of the BMI score with diastolic blood pressure is 0.002 and the Pearson correlation is 0.513 so that there is a relationship between the BMI score and diastolic blood pressure in hypertensive patients with a moderate relationship. Obesity can cause hypertension through various mechanisms, obesity occurs due to an increase in plasma volume and cardiac output which will increase blood pressure. So it is hoped that hypertensive patients maintain their diet and activity so that their body weight is in the normal category.

Keywords: Age, Body Mass Index (BMI) Score, Blood Pressure, Hypertension.

BACKGROUND

Hypertension is the most common condition encountered in primary care. Hypertension according to the World Health Organization (WHO) is a condition where the blood vessels have high blood pressure (systolic blood pressure more than 120 mmHg or diastolic blood pressure more than 90 mmHg) that persists. The level of health awareness in Indonesia is still low, where the number of patients who are not aware that they suffer from hypertension and who do not take their medication obediently is likely to be greater. This change is due to increasing knowledge of health and medicine as well as socio-economic influences in society which have an impact on culture and lifestyle in society (Indonesia, Hasil Utama Riskesdas ,

2018). In hypertensive patients, many of whom are obese, want to have an ideal body weight, but who still often eat fast food, eat foods high in fat such as fried foods (fried tofu, fried tempeh, etc.), and often consume meat (Wulandari & Puspita, 2019).

Results of observations carried out on 20th January 2023 in the Seruni Room at Dolopo Regional Hospital with 10 patients whose BMI was measured, 6 patients (80%) with BMI in the overweight category found 2 respondents with normal blood pressure (systolic < 120 mmHg and diastolic ≤80 mmHg), and 4 respondents (40%) were in the prehypertension category (systolic 120 –139 mmHg and diastolic 80–89 mmHg). In 2 respondents (20%) with a BMI in the obese category with hypertension blood pressure (systolic ≥140 mmHg and diastolic ≥ 90 mmHg) and 2 respondents (20%) with a BMI in the normal category with normal blood pressure (systolic < 120 mmHg, diastolic ≤80 mmHg).

Data from the World Health Organization (WHO) in 2015 shows that around 1.13 billion people in the world suffer from hypertension, which means 1 in 3 people in the world are diagnosed with hypertension. The number of hypertension sufferers continues to increase every year, it is estimated that 1.5 billion people will suffer from hypertension in 2025, and it is estimated that every year 10.44 million people will die from hypertension and its complications (Indonesia, Hipertensi, 2019). According to the results of the 2018 Basic Health Research (Riskesdas), the prevalence rate of hypertension in the population aged > 18 years in Indonesia is 34.1%. This prevalence was obtained by measuring the respondent's blood pressure based on the Joint National Committee (JNC) VII criteria, namely if the systolic blood pressure was > 140 mmHg or the diastolic blood pressure was > 90 mmHg. In East Java Province itself, the estimated number of hypertension sufferers in 2020 is around 36.3%. The prevalence increases with increasing age (Indonesia, Hasil Utama Riskesdas , 2018). In 2022, there were 437 hypertensive patients in the Seruni room with an average of 36 per month, while in January-May 2023 there were 177 hypertensive patients with an average of 35 patients.

Hypertension is a disease that occurs due to increased blood pressure. Hypertension often causes no symptoms, while blood pressure that is consistently high over a long period of time can cause complications. Therefore, hypertension needs to be detected early, namely by checking blood pressure regularly. Factors that influence blood pressure are age, gender, education level, physical activity, genetic factors (heredity), food intake, smoking habits, and stress. Hypertension can be caused by not consuming a varied and balanced diet. Eating a diverse diet shows a higher nutrient density (Seligman, Laraia, & Kushel, 2010).

Research using IFLS data shows that the greater the amount of consumption of diverse foods, the closer to normal a person's body mass index. Body mass index (BMI) significantly bridges the pathway between the amount of food consumed and a person's blood pressure (Isaura, 2018). Obesity can cause hypertension through various mechanisms, both directly and indirectly. Obesity can directly cause an increase in cardiac output because the greater the body mass, the greater the amount of blood circulating so that cardiac output also increases. Meanwhile, indirectly through stimulation of the activity of the sympathetic nervous system and the Renin Angiotensin Aldosterone System (RAAS) by mediators such as hormones, cytokines, adipokines, etc. One of them is the hormone aldosterone which is closely related to water and sodium retention so that blood volume increases. Hypertension is often referred to as the silent killer disease because sufferers cannot feel the symptoms. Therefore, if high blood pressure is not controlled it will have an impact on degenerative diseases, namely coronary heart disease, kidney problems, etc. and can cause death (Nuraini, 2015).

Management of hypertension can be done with non-pharmacological therapy and pharmacological therapy. In Non-Pharmacological Therapy, non-pharmacological therapy is medication-free treatment for hypertension sufferers, including using a healthy diet. Diet is planning meals according to correct rules. The correct diet is to continue consuming food with the composition needed by the body in balanced quantities. Hypertension sufferers are advised

to reduce salt intake, eat balanced nutrition by eating portions of fruit and vegetables per day, exercise regularly, improve unhealthy lifestyles, stop smoking and not consume alcohol. Pharmacological management is by taking recommended antihypertensive drugs which aim to keep blood pressure in hypertension sufferers under control and prevent complications (Nuraini, 2015).

METHODS

This research uses a correlation research design with a cross sectional approach. The research was carried out from 1-31 August 2023. The population of all hypertensive patients in the Seruni Room at Dolopo Regional Hospital was 35 patients. The sampling technique uses accidental sampling. The sample was 35 respondents who met the inclusion criteria. Inclusion criteria include not suffering from complications of hypertension (kidney, coronary heart disease, stroke), adult age (26-45 years) and elderly (46-65 years). Independent variables: Age using a questionnaire and Body Mass Index (BMI) using a weight and height observation sheet and the dependent variable Blood Pressure using a Blood Pressure Observation Sheet. Data analysis used the Pearson Product Moment statistical test with $\alpha = 0.05$.

RESULTS

1. The Age Respondent

Table 1. Distribution of Age Respondent

Variable	n	Mean	SD	Min	Max
Age	35	42	8,9	28	63

Based on Table 1. It is known that from 35 respondents the average age is 42 years, the minimum age is 28 years and the maximum age is 63 years.

2. The IMT Score Respondent

Table 2. Distribution IMT Score Respondent

Variable	n	Mean	SD	Min	Max
IMT Score	35	23,9	3,56	16,7	28,1

Based on Table 2. It is known that from 35 respondents the average BMI score was 23.9, the minimum score was 16.7 and the maximum score was 28.1.

3. The Blood Pressure Respondent

Table 3. Distribution Blood Pressure Respondent

Variable	n	Mean	SD	Min	Max
Sistole	35	132,6	12,2	120	170
Diastole		84,0	6,5	80	110

Based on Table 3, it is known that from 35 respondents the average systolic blood pressure was 132.6 mmHg, a minimum of 120 mmHg and a maximum of 170 mmHg. The average diastolic blood pressure is 84 mmHg, minimum 80 mmHg and maximum 110 mmHg.

4. The Correlation Age and Body Mass Index (BMI) Score with Blood Pressure in Hypertension Patient

Table 4. Correlation Age and Body Mass Index (BMI) Score with Blood Pressure in Hypertension Patient

Variable	Sistole		Diatole	
	Pvalue	Pearson Correlation	Pvalue	Pearson Correlation
Usia	0,000	0,659	0,000	0,647
IMT	0,003	0,483	0,002	0,513

Based on table 4. The results of the Pearson product moment test show that the p value for age and systolic blood pressure is 0.000 and the Pearson correlation is 0.659, so there is a strong relationship between age and systolic blood pressure in hypertensive patients. The results of the Pearson product moment test show that the p value for age and diastolic blood pressure is 0.000 and the Pearson correlation is 0.647, so there is a strong relationship between age and diastolic blood pressure in hypertensive patients. The results of the Pearson product moment test show that the p value of the BMI score with systolic blood pressure is 0.003 and the Pearson correlation is 0.483, so there is a relationship between BMI score and systolic blood pressure in hypertensive patients with a moderate relationship. The results of the Pearson product moment test show that the p value of the BMI score with diastolic blood pressure is 0.002 and the Pearson correlation is 0.513 so that there is a relationship between the BMI score and diastolic blood pressure in hypertensive patients with a moderate relationship.

DISCUSSION

1. The Correlation Age with Blood Pressure in Hypertension Patient

The results of the Pearson product moment test show that the p value for age and systolic blood pressure is 0.000 and the Pearson correlation is 0.659, so there is a strong relationship between age and systolic blood pressure in hypertensive patients. The results of the Pearson product moment test show that the p value for age and diastolic blood pressure is 0.000 and the Pearson correlation is 0.647, so there is a strong relationship between age and diastolic blood pressure in hypertensive patients.

This research is in line with research by Mahmudah et al which states that the prevalence of hypertension increases with age. This is due to natural changes in the heart, blood vessels and hormone levels which can increase blood pressure. For this reason, age greatly influences the increase in blood pressure, so the elderly are advised to always control their blood pressure every month by attending the elderly posyandu (Mahmudah, T, FA, & Malkan, 2015).

This research is in line with research by Ayu Putri and Evelin, 2022 there is a relationship between BMI and systolic blood pressure which has a significant relationship with p-value = 0.05, while the relationship between BMI and diastolic blood pressure has a negative result (p=>0.05) in adults in Ponain Village (Abineno & Malinti, 2022). Being overweight can be a contributing factor to disease, one of which is hypertension. The Framingham Study found a 15% increase in body weight could result in an 18% increase in systolic pressure. People who are overweight fall into the overweight category with a 20% increase in body weight having an eight times greater risk of hypertension (Malinti & Malinti, 2020). BMI has a major impact on the incidence of hypertension, and excessive BMI is associated with higher risk factors for hypertension compared to BMI within the normal range (Herdiani, 2019).

Research conducted on 60 adult men and women each showed that higher blood pressure was found at higher BMI as well. So it is concluded that a high BMI has the effect of increasing blood pressure. This happens because BMI describes a high composition of carbohydrates and fats which causes continuous accumulation of triglycerides in the blood vessels, which is the initial process of atherosclerosis, which is the trigger the occurrence of

hypertension. The heavier a person is, the greater the amount of blood needed in the body to provide oxygen to the body's tissues, and the increased amount of blood circulating through the blood vessels puts pressure on the artery walls (Malinti, Elon, Sri, & Wulandari, 2020). A literature review by (Linderman et al., 2018) from a population of 1.7 million in China to show the relationship between BMI and high blood pressure can contribute to heart disease if an unhealthy lifestyle with increased physical activity, balanced nutrition, and rest (Linderman, 2018). One of the factors that influences blood pressure is age. As you get older, the elasticity of blood vessels decreases and stiffness and brittleness of blood vessels occurs so that blood flow, especially to the brain, becomes disrupted. As age increases, the incidence of hypertension can increase.

Based on research on the prevalence of hypertension and its determinants in Indonesia in 2009, it was found that the 25-34 year age group had a risk of hypertension 1.56 times compared to those aged 18-24 years. The risk of hypertension increases significantly with increasing age, from the age group ≥75 years the risk is 11.53 times. For respondents who are in late adulthood, this is a continuation of adolescence and early adulthood, so that the aging process occurs, especially in the blood vessel system which experiences less elasticity which causes higher blood pressure. After menopause, women generally have higher blood pressure than before (Berman, Snyder, & Frandsen, 2016).

The systolic blood pressure of the elderly usually increases with increasing age, while the systolic blood pressure usually only increases until the age of 50 and then decreases so that at that time, the formula for blood pressure is age plus 100. So if a person is 60 years old, the systolic blood pressure is 160 mmHg considered normal. Cardiovascular in the elderly, heart valves thicken and stiffen, the ability to pump blood decreases (decreased contraction and volume), blood vessel elasticity decreases, and peripheral blood vessel resistance increases so that blood pressure increases. Blood pressure varies greatly depending on circumstances, will increase during physical activity, emotions and stress, and decrease during sleep. Elderly people who lie down for too long can experience a sudden drop in blood pressure when they stand up and walk (Santoso, 2009). In elderly people, blood pressure when sitting is very different from when standing. Therefore, blood pressure measurements need to be carried out in a standing position and also in certain circumstances (Potter, 2015).

2. The Correlation Body Mass Index (BMI) Score with Blood Pressure in Hypertension Patient

The results of the Pearson product moment test show that the p value of the BMI score with systolic blood pressure is 0.003 and the Pearson correlation is 0.483, so there is a relationship between BMI score and systolic blood pressure in hypertensive patients with a moderate relationship. The results of the Pearson product moment test show that the p value of the BMI score with diastolic blood pressure is 0.002 and the Pearson correlation is 0.513 so that there is a relationship between the BMI score and diastolic blood pressure in hypertensive patients with a moderate relationship.

The results of this study are in line with Ikhya and Yogi, 2018 with the results of systolic blood pressure p value = 0.029; r = 0.154 and diastolic blood pressure p value = 0.009; r = 0.183 (Ulumuddin & Yhuwono, 2018). In obese sufferers, the heart's work increases to pump blood. The greater the body mass, the more blood supply is needed to supply oxygen and nutrients to body tissues. This results in the volume of blood circulating through the blood vessels increasing, so that the pressure on the artery walls becomes greater17. The role of obesity levels in high blood pressure is also due to the stimulation of the activity of the sympathetic nervous system and the Renin Angiotensin Aldosterone System (RAAS) by mediators such as hormones, adipokines, cytokines, etc. One of them is the hormone aldosterone which is closely related to water and sodium retention so that blood volume increases (Sulastri & Elmatris, 2012).

One of the factors that triggers an increase in blood pressure is body mass index. According to the Ministry of Health of the Republic of Indonesia BMI is the result of dividing body weight and height squared (meters) to assess a person's nutritional status. Body mass index can describe the level of apoptosis in the human body, health risks can occur if there is excessive fat in the body (Indonesia, Hipertensi, 2019).

Body weight and BMI are directly correlated with blood pressure, especially systolic blood pressure. If 5 kg of excess body weight is lost, systolic blood pressure will decrease by 2-10 points. Body Mass Index, people whose BMI is in the obesity category tend to have higher blood pressure. According to the National Institutes for Health USA (NIH, 1998), the prevalence of high blood pressure in people with a Body Mass Index (BMI) >30 (obese) is 38% for men and 32% for women, compared with a prevalence of 18% for men and 17 % for women for those with BMI (Potter, 2015)

CONCLUSION

The results of the study show that there is a relationship between age and BMI and blood pressure, so it is hoped that hypertensive patients will maintain their weight, especially if they are elderly.

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