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memang benar yang bersangkutan telah mengirimkan artikel yang berjudul “**RISK FACTORS OF HYPERTENSION IN THE ELDERLY**” dan telah dinyatakan layak untuk dimuat (dipublikasikan) pada Nusantara Hasana Journal Volume 3 Nomor 8, Edisi bulan Januari 2024 di <https://nusantarahasanajournal.com/index.php/nhj> dengan E-ISSN : 2798-1428. Demikian Letter of Acceptance ini dibuat untuk dapat dipergunakan sebagaimana mestinya.

Mataram, 27 Desember 2023

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RISK FACTORS OF HYPERTENSION IN THE ELDERLY

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Comment [u1]: Both, modifiable and unmodifiable?
Add it in operational definition

Abstract

Background: Hypertension is caused by an abnormal increase in blood pressure beyond normal values, namely systolic blood pressure ≥ 140 mmHg and diastolic blood pressure ≥ 90 mmHg measured at least twice in a sitting position. Hypertension indicates the occurrence of hemodynamic imbalance in the cardiovascular system caused by several aspects or multi-aspects and difficult to detect with one aspect only. **Methods:** Hypertension detected during a physical examination is caused by certain diseases, so it is referred to as "The Silent Killer" because it often appears without symptoms. Elderly is someone who has entered the age of ≥ 60 years. **Result:** The elderly are at high risk of degenerative diseases, one of which is hypertension because the elderly will experience the aging process that causes changes in the body's work system such as cardiovascular. As we get older, the walls of blood vessels tend to be more rigid and their elasticity will decrease so that blood is forced to pass through narrow blood vessels and result in hypertension. **Conclusion:** Factors that often cause hypertension are divided into two factors such as gender, age, genetics and factors that can be changed such as diet, stress, obesity, physical activity, and smoking.

Keywords: Elderly, Hypertension, Risk factors, Cardiovascular Diseases.

Comment [u2]: is this a literature review?

Abstrak

Hipertensi disebabkan oleh peningkatan tekanan darah yang abnormal melebihi nilai normal, yaitu tekanan darah sistolik ≥ 140 mmHg dan tekanan darah diastolik ≥ 90 mmHg diukur setidaknya dua kali dalam posisi duduk. Hipertensi merupakan terjadinya ketidakseimbangan hemodinamik pada sistem kardiovaskular yang disebabkan oleh beberapa aspek atau multi aspek dan sulit dideteksi dengan satu aspek saja. Hipertensi yang terdeteksi pada saat pemeriksaan fisik disebabkan oleh penyakit tertentu, sehingga disebut sebagai "The Silent Killer" karena sering muncul tanpa gejala. Lansia adalah seseorang yang telah memasuki usia ≥ 60 tahun. Lansia berisiko tinggi terkena penyakit degeneratif, salah satunya hipertensi karena lansia akan mengalami proses penuaan yang menyebabkan perubahan sistem kerja tubuh seperti kardiovaskular. Seiring bertambahnya usia, dinding pembuluh darah cenderung semakin kaku dan elastisitasnya akan menurun sehingga darah terpaksa melewati pembuluh darah yang sempit dan mengakibatkan hipertensi. Faktor-faktor yang sering menyebabkan hipertensi dibagi menjadi dua faktor seperti jenis kelamin, usia, genetika dan faktor-faktor yang dapat diubah seperti diet, stres, obesitas, aktivitas fisik, dan merokok.

Kata Kunci: Lansia, Hipertensi, Faktor Risiko, Penyakit Kardiovaskular

1. INTRODUCTION



Hypertension is caused by an abnormal increase in blood pressure beyond normal values, namely systolic blood pressure ≥ 140 mmHg and diastolic blood pressure ≥ 90 mmHg measured at least twice in a sitting position.¹ Systolic blood pressure is the pressure when the heart is contracting and pumping blood out of the arteries while diastolic pressure is at its lowest point when the heart is relaxed and replenishing blood.²

Hypertension is a cardiovascular disease, estimated to have become a global morbidity rate of 4.5% with almost the same prevalence in developing and developed countries where the prevalence of hypertension in developing countries is 40% and in developed countries is 35%.^{3,4} The World Health Organization (WHO) and The International Society Of Hypertension (ISH) report there are 600 million cases of hypertension worldwide, 3 million of them have died every year.³ The World Health Organization (WHO) predicts that in 2025 there will be an increase in hypertension cases of around 80% from 639 million cases of hypertension in 2000 will increase to 1.5 billion cases, especially in developing countries, one of which is Indonesia. Law of the Republic of Indonesia Number 13 of 1998, the definition of elderly is someone who has entered the age of ≥ 60 years.^{5,6}

2. RISK FACTORS HYPERTENSION

The elderly are at high risk of degenerative diseases, one of which is hypertension because the elderly will experience the aging process, causing changes in the body's work system such as cardiovascular. As we get older, the walls of blood vessels tend to be more rigid and their elasticity will decrease so that blood is forced to pass through narrow blood vessels and cause hypertension.¹

Factors that often cause hypertension are divided into two factors such as gender, age, genetics and factors that can be changed such as diet, stress, obesity, physical activity, and smoking. Risk factors for hypertension Risk factors are classified into two, namely modifiable and non-modifiable risk factors.^{7,8}

Non-modifiable factors

a. Genetic

The presence of genetic factors in the family can cause the family to have a risk of suffering from hypertension. This is in line with increasing intracellular sodium levels and decreasing the ratio between potassium to sodium, individuals with parents with hypertension have twice the risk of suffering from hypertension than people who do not have a family history of hypertension. It is found that about 70-80% of people with essential hypertension are people with a family history of hypertension.⁹

b. Age

Age can affect the occurrence of hypertension, as we get older the risk of developing hypertension becomes greater. In old age, hypertension is found only in the form of an increase in systolic blood pressure. This is due to structural changes in large blood vessels.¹⁰

c. Gender

Sex factors were found to influence sex with the incidence of hypertension. The male sex has twice the risk of the female sex. This is because most men have a bad lifestyle. Hypertension can also increase in women if they are menopausal due to hormonal influences.^{5,7} Women who have



not entered menopause are protected by the hormone estrogen, which plays a role in increasing High Density Lipoprotein (HDL) levels. Elevated levels of high HDL cholesterol can be a protective factor in preventing the occurrence of atherosclerosis. Premenopausal women begin to lose less of the hormone estrogen, which protects blood vessels from damage. This continues until the estrogen hormone changes in quantity with age, generally starting to occur in women aged 45-55 years.¹¹

Modifiable factors

a. Smoking

The presence of toxic chemicals such as nicotine and carbon monoxide smoked through cigarettes then enters the bloodstream so that it can damage the endothelial lining of arteries and result in the process of atherosclerosis and high blood pressure (hypertension). Smoking can cause an increase in heart rate and the need for oxygen to be supplied to the heart muscle. The nicotine in tobacco in cigarettes is the cause of the rise in blood pressure immediately after the first puff, nicotine is absorbed by small blood vessels in the lungs so that it is circulated into the bloodstream so that nicotine reaches the brain in just a few seconds. The brain reacts to nicotine by signaling the adrenal glands to release epinephrine (adrenaline) so that this hormone can constrict blood vessels and force the heart to work harder due to higher pressure.¹²

b. Sodium Consumption

Sodium absorbed into blood vessels comes from high salt consumption causing water retention, resulting in increased blood volume. High sodium intake can lead to excessive natriuretic hormone secretion resulting in an increase in blood pressure.¹³

c. Obesity

Body mass index (BMI) is very influential on the incidence of hypertension, where excessive BMI (obesity) can trigger higher hypertension risk factors than someone with a normal BMI.¹⁴ Central obesity associated with insulin resistance and dyslipidemia, is a determinant factor in the process of increasing blood pressure. Adipose tissue present in the abdomen is involved in the pathogenesis of coronary heart disease, stroke, and heart failure. Some mechanisms of hypertension associated with obesity, namely changes in the RAA system (rennin angiotensin aldosterone) that increase sympathetic nervous system activity, insulin resistance, leptin resistance, changes in coagulation factors, inflammation, and endothelial dysfunction. Obesity can also trigger hypertension by increasing sodium reabsorption in the kidneys so that it interferes with sodium excretion.¹⁵

d. Physical Activity

Physical activity is any body movement that increases energy and energy expenditure (burning calories). Physical activity should be done at least 30 minutes per day in the right way. The benefits of physical activity are to keep blood pressure stable within normal limits. People with a lifestyle that lacks physical activity are more susceptible to high blood pressure (hypertension). The benefits of doing regular exercise can maintain weight and lower blood pressure. Moderate aerobic exercise for 30 minutes a day for a few days each week can lower blood pressure. The types of exercise to control blood pressure such as walking, cycling, swimming, and aerobics¹²

e. Stress

American Institute of Stress (AIS), no definitive relationship was found between stress and hypertension, but long-term stress levels were found to be the cause of future hypertension. Stress can affect the hypothalamic-pituitary-adrenal axis system and autonomic nervous system, causing abnormal norepinephrine release and can impair vascular performance, improper sympathetic drive contributing to increased arterial pressure.¹⁶

Pathophysiology

Hypertension that occurs in old age is isolated systolic hypertension where there is an increase in systolic blood pressure accompanied by a decrease in diastolic blood pressure, due to changes that occur in the structure of the main blood vessels so that they become less elastic and stiff. The increase in TDS is caused by stiffness of the artery walls and reduced elasticity of the aorta, this causes narrowing of blood vessels, then the blood flow to tissues and organs around the body becomes reduced so that there is an increase in systolic blood pressure so that blood flow to the tissues and organs of the body remains sufficient.¹² As we get older, there is stiffness of the blood vessel walls and their elasticity decreases so that blood is forced to pass through narrow blood vessels and results in hypertension.¹

Comment [u3]: Give it more spasi

3. RESULTS AND DISCUSSIONS

Elderly and Risk Factors for Hypertension

The elderly are someone who has reached the age of 60 years and over 17 and has entered the final stage of development in human life, where old age is a group of people who are undergoing a process of gradual change over time. Hypertension or high blood pressure often occurs in old age. Systolic pressure increases by an average of 20 mmHg at the age of 30-65 years and continues to increase after the age of 70 years. Increased blood pressure is related to age-related factors where isolated systolic hypertension is associated with increased peripheral vascular resistance in the arteries.¹⁹ The function of human organs if you get older will weaken and susceptible to disease. When a person's age increases, the artery walls thicken due to the buildup of collagen in the muscle layer, so that blood vessels experience narrowing and become stiff.²⁰

Gender and Hypertension

The proportion of incidence of hypertension is not much different between men and women. Men often develop hypertension in their late thirties, while women develop hypertension after menopause. Women's blood pressure, especially systolic rises higher with age. After the age of 55 years women have a higher risk of suffering from hypertension, one of the causes of this occurrence is due to hormonal differences between the sexes. In women, the production of the hormone estrogen decreases during menopause, resulting in an increase in blood pressure.⁵ It was found that there was an influence of sex factors with the incidence of hypertension. Men have a higher risk than women, generally men have a bad lifestyle. Hypertension increases in women if they are menopausal due to hormonal influences.⁵ Women who have not entered menopause are protected by the hormone estrogen, this hormone plays a role in increasing High Density Lipoprotein (HDL) levels. Elevated levels of HDL cholesterol become a protective factor in preventing the occurrence of atherosclerosis. Premenopausal women experience a decrease in the hormone estrogen, this hormone plays a role in protecting blood vessels from



damage. This continues until the hormone estrogen changes in quantity with increasing age, generally begins to occur in women aged 45-55 years.¹¹ In theory, men are more at risk of hypertension than women due to poor lifestyle factors, while in women due to postmenopausal hormonal factors.²¹

Genetic and Hypertention

Hypertension has a tendency to decrease in later generations. This risk factor cannot be eliminated but can be anticipated as early as possible by diligently doing blood pressure control at the Puskesmas or Hospital. A person with a history of hypertension does not necessarily suffer from the same disease, this genetic factor is influenced by other factors that can cause a person to suffer from hypertension.⁹ This is in line with increased intracellular sodium levels and the low ratio of potassium to sodium of individuals with parents with hypertension, having twice the risk of suffering from hypertension than people who do not have a family history of hypertension.^{7,9} Genetic factors related to salt metabolism and renin regulation in cell membranes through genes that play a role in sodium homeostasis in the kidneys, namely WNK-1 (lysine-deficient protein kinase gene), SNN1B (amilorid-sensitive sodium channel), SCNN1G (beta and gamma subunit genes that code for 2 sodium channel ENaC sub-units) affect the Na-K pump in the renal tubules thereby increasing sodium and water retention in the kidneys. This increases plasma volume and an increase in extracellular fluid leads to increased venous return blood flow to the heart and increased cardiac output which will increase arterial pressure resulting in hypertension, the gene also increases the production of aldosterone so that sodium retention in the kidneys increases and will cause an increase in cardiac output resulting in increased arterial pressure resulting in hypertension.²² According to Mendel's law, if only one parent suffers from hypertension then the probability of the child not developing hypertension is 50%, if both parents suffer from hypertension the probability of their child to develop hypertension is 60%.^{23,24} Some risk factors that can cause hypertension due to a poor lifestyle such as consuming foods high in fat, cholesterol, sodium, and lack of physical activity. Body Mass Index (BMI) affects the incidence of hypertension, BMI that exceeds normal values or overweight can trigger the occurrence of hypertension risk factors higher than someone with a normal BMI.²⁵

Obesity and Hypertention

Obesity is associated with insulin resistance and dyslipidemia, which is a determinant factor in the process of increasing blood pressure. Several mechanisms of hypertension are associated with obesity, due to changes in the RAA system (rennin angiotensin aldosterone) that increase sympathetic nervous system activity, insulin resistance, leptin resistance, changes in coagulation factors, inflammation, and endothelial dysfunction. Obesity can also trigger hypertension by increasing sodium reabsorption in the kidneys so as to interfere with sodium excretion.¹⁵

When a person is obese or overweight will need more blood to supply oxygen and eat body tissues, so that the volume of blood circulating through blood vessels increases, cardiac output also increases and there is an increase in blood pressure.²⁶ Several factors, namely psychological, socioeconomic, and occupational factors result in the elderly having normal nutritional status their blood pressure is higher, Because the hypertension he experienced came from a lot of energy and mind expenditure on the problems faced, so that the occurrence of



hypertension was not only caused by excessive nutritional status. The habit of consuming foods high in sodium, cholesterol, flavoring spices (MSG), milk and processed can trigger hypertension. This is due to the frequency of consumption and proportion of food eaten as well as characteristics associated with the incidence of hypertension.²⁷ Sodium absorbed into the blood vessels from excess salt consumption can cause water retention, resulting in increased blood volume. High sodium intake causes excessive production of natriuretic hormones thereby increasing blood pressure.¹³

Smoking Habits and Hypertention

Smoking habits cause the presence of toxic chemicals such as nicotine and carbon monoxide smoked through cigarettes then into the bloodstream can damage the endothelial lining of arteries resulting in the process of atherosclerosis and high blood pressure. Smoking causes an increase in heart rate and the need for oxygen to be supplied to the heart muscle. Nicotine in cigarettes is the cause of rising blood pressure. Immediately after the first puff, nicotine is absorbed by small blood vessels in the lungs and circulated to the bloodstream and reaches the brain within seconds. The brain reacts to nicotine by signaling the adrenal glands to release epinephrine (adrenaline) so that this hormone can constrict blood vessels and force the heart to work harder due to higher pressure.¹²

Nicotine can increase adrenaline which makes the heart beat faster and work harder, the frequency and contraction of the heart increases, giving rise to hypertension. The levels of cigarette chemicals in the blood are determined by the amount of cigarette consumption. The more the amount of cigarette consumption per day, the more severe hypertension a person experiences. The mechanism underlying the relationship of smoking with blood pressure is an inflammatory process, both in former smokers and active smokers. There is an increase in the amount of reactive protein C, including natural inflammatory proteins, resulting in inflammatory processes in the endothelium, resulting in damage to vascular endothelial cells, and stiffness in artery walls leading to increased peripheral vascular resistance.²⁸

Nicotine stimulates the sympathetic nervous system, so that the nerve endings release the stress hormone norepinephrine and immediately bind to alpha-1 hormone receptors. This hormone flows in blood vessels throughout the body. This condition makes the heart beat faster (tachycardia), blood vessels will experience vasoconstriction. So that there is a narrowing of blood vessels and obstructing normal blood flow and there is an increase in blood pressure.²⁹ Field data in this study found that most respondents were non-smokers, this was because respondents were dominated by women rather than men.²⁹

Physical Activity and Hypertention

Physical activity can affect blood pressure stability. Someone who is less active in physical activity has a higher heart rate. This results in the heart muscle working harder with each contraction. The harder the heart muscle attempts to pump blood, the greater the pressure exerted on the artery walls, increasing peripheral resistance and causing an increase in blood pressure. Regular exercise makes the heart muscle stronger and can reduce systolic and diastolic pressure.³⁰ Physical activity is a body movement caused by the skeletal muscles and results in energy expenditure. Physical activity can prevent an increase in blood pressure in people with hypertension by exercising regularly, ideally 3-5 times a week. Sports that are recommended for

people with hypertension are light exercise such as walking, jogging, and cycling.^{31,32} The World Health Organization recommends doing 30 minutes/day of moderate-intensity physical activity in 1 week or 20 minutes/day for 5 days a week at a vigorous intensity to get optimal results from physical activity or exercise.³⁰

4. CONCLUSIONS & RECOMMENDATIONS

Elderly is a natural process that cannot be avoided by everyone where this aging process affects physical and mental changes that result in decreased body resistance causing various diseases.¹⁸ Elderly are at high risk of degenerative diseases, one of which is hypertension because the elderly will experience the aging process causing changes in the body's work system such as cardiovascular

Comment [u4]: appear in the abstract

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