CHAPTER II

LITERATURE REVIEW

2.1 Basic Concepts Of Hypertension

2.1.1 Definition Of Hypertension

Hypertension, which is often referred to as high blood pressure, occurs when systolic blood pressure reaches 140 mmHg or more, and diastolic pressure reaches 90 mmHg or more. This disease is often called the "Silent Killer" because it is dangerous but often does not show clear symptoms, and until now, it remains one of the serious health threats. Anyone can be affected by this condition without clear signs, making it important to always be vigilant and maintain health (Kemenkes RI, 2021).

Individuals are detected to have hypertension or high blood pressure after blood pressure examinations are conducted several times, and the results indicate that systolic pressure exceeds 140 mmHg and/or diastolic pressure is more than 90 mmHg (Unger et al., 2020). This rule applies to all adults over the age of 18. If blood pressure exceeds the normal figure of 120/80 mmHg, then this condition is called hypertension (Hidayati et al., 2022).

Hypertension, or high blood pressure, is a long-term condition that occurs due to high blood pressure that continuously exists in the arteries. This pressure comes from the heart's work in pumping blood throughout the body. Hypertension occurs when there is an increase in pressure in the systemic arteries, both in systolic and diastolic pressure. Because it often does not indicate clear symptoms,

hypertension is difficult to detect. However, many signs that need to be watched out for include dizziness, restlessness, flushed face, ringing in the ears, shortness of breath, fatigue, and blurred vision (Sijabat et al., 2020).

2.1.2 Risk Factors For Hypertension

Hypertension is influenced by two categories of risk factors: factors that cannot be changed and factors that are inherent to the patient that are difficult to avoid (Kartika et al., 2021).

1. Unchangeable Risk Factors

   The following factors arise from an individual's inherent conditions, including genetics inherited from parents or certain genetic mutations, which increase the risk of hypertension. Here is the explanation :

   a. Age

      As age increases, the risk of hypertension tends to rise. The cause is the natural physiological changes in the body that affect heart function, blood vessels, and hormonal balance, leading to hypertension being more common in older age groups.

   b. Gender

      Hypertension is also related to gender. For men, hypertension is more commonly seen in young to middle-aged adults, while for women, the tendency increases after entering menopause, especially after the age of 55.

   c. Genetics

A person's risk of developing hypertension increases if there is a family history of hypertension, and it can even be inherited by their descendants. In such cases, the likelihood of developing hypertension can increase up to four times. Research conducted by Agnesia revealed that individuals with a family history of hypertension are 14.378 times more likely than those without such a history. Data also indicates that if one parent suffers from a non-communicable disease, their children tend to have a greater likelihood of developing similar diseases throughout their lives. If both parents suffer, the risk increases by up to 60%.

2. Risk Factors That Can Be Changed

The following risk factors arise from unhealthy lifestyle habits and can be addressed by changing lifestyle. Here are some behaviors that influence the risk of hypertension:

a. Smoking

Cigarettes contain more than 4,000 harmful chemicals that have adverse effects on health, both for active and passive smokers. Nicotine and carbon monoxide in cigarette smoke are inhaled into the blood, damaging blood vessel tissue (endothelium), and contributing to arteriosclerosis and narrowing of blood vessels (vasoconstriction). This condition causes an increase in heart rate of up to 30% and raises blood pressure. Nicotine is also addictive and stimulates the release of adrenaline, making the heart work harder. Studies indicate that smoking causes stiffness in blood vessels, so quitting this habit is an important

step to prevent hypertension and other cardiovascular diseases (Lukitaningtyas & Cahyono, 2023).

b. Low Fiber Diet

Individuals who follow a low-fiber diet tend to be at higher risk of experiencing high blood pressure compared to those who consume high-fiber foods. Fiber plays an important role in helping the body eliminate waste, which largely contributes to increased blood pressure if not managed properly. Fiber helps bind waste in the large intestine, thereby reducing the workload of the kidneys that are responsible for processing excess sodium and glucose. A high-fiber diet supports digestion by optimizing food binding and helps control blood pressure. Therefore, changing the diet from low fiber to high fiber is an effective step to lower blood pressure (Cholifah & Sokhiatun, 2022).

c. Consumption Of High Fat Foods

The habit of consuming foods rich in saturated fats can increase the likelihood of hypertension, especially through weight gain. Saturated fats also contribute to atherosclerosis, which is the narrowing of blood vessels that can cause an increase in blood pressure. Fatty acids are divided into three types: saturated, trans, and unsaturated (both monounsaturated and polyunsaturated). Trans fatty acids, which are often found in fried foods, when consumed excessively can lower good cholesterol (HDL) levels and promote an increased risk of heart disease and hypertension. From Ratu Ayu Dewi Sartika, atherosclerosis due to

excess trans fatty acids becomes one of the main triggering factors for hypertension and cardiovascular diseases (Lukitaningtyas & Cahyono, 2023).

d. Excess Sodium Consumption

Excessive salt intake is one of the main causes of hypertension. WHO recommends a daily salt intake of no more than 6 grams (equivalent to 2.4 grams of sodium). Excess salt causes fluid retention in the body, increases blood volume, and triggers high blood pressure. High sodium intake also affects natriuretic hormones, which ultimately increases blood pressure indirectly (Yunus et al., 2023).

e. Dyslipidemia

Dyslipidemia is one of the main indicators of cardiovascular disease risk. This condition is characterized by low levels of good cholesterol (HDL) and increased levels of bad cholesterol (LDL), total cholesterol, and triglycerides. One form of dyslipidemia that is often encountered is familial hypercholesterolemia, which affects about 1 in 500 people. Dyslipidemia can disrupt the function of the blood vessel lining (endothelium) and reduce baroreflex sensitivity, the body's mechanism that regulates blood pressure. As a result, this condition often triggers hypertension (Kemenkes RI, 2022).

Based on the guidelines from the National Cholesterol Education Program, the total cholesterol level that is considered healthy should not exceed 200 mg/dl, while the LDL level should not exceed 130 mg/dl,

and the ideal triglyceride level should be less than 150 mg/dl. If these levels exceed the normal limits, the following condition is called dyslipidemia. The normal level of good cholesterol (HDL) should reach 40 mg/dl or more. A decrease in HDL below this number also indicates the presence of dyslipidemia.

Research on awareness of hypertension and dyslipidemia in Cimalaka, Sumedang Regency, indicates that the increase in total cholesterol and LDL levels is the most common form of dyslipidemia. High blood cholesterol levels can be influenced by various factors, including genetic factors, a diet rich in fats, obesity, lack of physical activity, and smoking habits. In addition, alcohol consumption or the use of certain medications, including steroids or contraceptive pills, can also cause an increase in LDL levels.

To lower cholesterol and LDL levels, the first step that needs to be taken is to change lifestyle. This includes efforts to maintain an ideal body weight, regular exercise, and choosing foods that are low in saturated fats and cholesterol. If lifestyle changes alone are not effective enough, the use of cholesterol-lowering medications can be a solution. One of the most common and effective medications is statins. This medication not only plays a role in increasing good cholesterol (HDL) levels but also slows the progression of atherosclerosis, helps repair damage to blood vessels, and widens arteries (Syamsunarno et al., 2017).

f. Lack of Physical Activity

When exercising, the body requires more oxygen; as a result, the heart needs to work harder in pumping blood with a larger volume to meet the body's needs. Several factors that affect blood pressure include tension in the arteries, blood volume, blood flow rate, and its viscosity. Blood pressure is generally measured by the comparison between systolic and diastolic pressure. For adults, normal blood pressure is at 120/80 mmHg, while for individuals over 60 years old, the normal number tends to be higher, around 140/90 mmHg.

During physical activity, the brain triggers the formation of a protein known as Brain Derived Neurotrophic Factor (BDNF), which plays an important role in supporting the health and function of nerve cells; physical activity also directly affects blood pressure. A lack of physical movement and an increased risk of overweight can increase the likelihood of hypertension occurring. For individuals who are less active, their heart rate tends to be higher, causing the heart muscle to work harder each time it contracts. This adds pressure to the arteries and increases the risk of complications, including coronary heart disease, kidney disorders, stroke, and other health conditions.

g. Stress

Essential hypertension is often influenced by environmental factors such as stress. Stress triggers the activity of the sympathetic nervous system, which is active when the body is active, while the

parasympathetic nerves function when the body is at rest. When someone experiences stress, cortisol and adrenaline hormones are produced in greater amounts, stimulating the nervous system. This process begins in the limbic system of the brain, which manages emotions, then continues to the hypothalamus and the sympathetic nervous system. As a result, blood pressure increases, the body consumes more energy, blood glucose levels rise, muscles become tense, mental activity increases, and blood becomes thicker. All of this can worsen the condition of hypertension (Hidayati et al., 2022).

h. Overweight/Obesity

Obesity plays a role in the development of hypertension through various means, both directly and indirectly. Directly, the increase in body mass leads to an increase in circulating blood volume, forcing the heart to work harder to meet the body's oxygen and nutrient needs. This situation causes an increase in heart rate and blood pressure, as the heart must pump more blood throughout the body.

Indirectly, obesity affects the sympathetic nervous system and the Renin Angiotensin Aldosterone System (RAAS) through mediators including hormones, adipokines, and cytokines. In the kidneys, the hormone aldosterone promotes an increase in sodium reabsorption, which leads to sodium and water retention, thereby increasing blood volume and blood pressure.

In addition, the condition of obesity raises lipid levels from fat cells, free fatty acids, insulin, and the risk of obstructive sleep apnea, contributing to this condition. This leads to the narrowing of blood vessels and increases the activity of the sympathetic nervous system. In the kidneys, this activity stimulates the renin-angiotensin system to reabsorb more sodium, which ultimately worsens the increase in blood pressure (Badriyah & Pratiwi, 2024).

i. Alcohol Consumption

Alcohol can increase the acidity levels in the blood, similar to the effects of carbon monoxide. This condition causes an increase in blood viscosity, making the heart work harder to circulate it throughout the body. Moreover, alcohol consumption also directly affects blood pressure; the more alcohol consumed, the greater the risk of developing hypertension.

Drinking two glasses or more of alcohol every day can double a person's risk of hypertension. Additionally, excessive alcohol consumption not only affects blood pressure but also can damage the heart as well as other body organs, making it one of the main causes of various health problems. In addition, excessive alcohol consumption can cause serious damage to the heart and various other vital organs (Lukitaningtyas & Cahyono, 2023).

2.1.3 Diagnostic/Clinical Tests For Hypertension

1. Health History

   Hypertension often does not show visible symptoms, but there are many signs that can indicate the presence of secondary hypertension or other complications that require further evaluation (Moningka et al., 2021). Therefore, it is highly recommended to conduct a thorough examination related to personal and family health history, which includes :

   a. Blood pressure

      - The initial time of hypertension occurrence, duration of the disease, and the level of blood pressure recorded currently or previously.
      - Use of antihypertensive medications, both currently applied and previously.
      - Use of other medications or over-the-counter products that may affect blood pressure.
      - History of side effects or incompatibility with antihypertensive medications.
      - Level of adherence to treatment, including the relationship with previous hypertension history related to the use of oral contraceptives or pregnancy.

   b. Risk factors

      - History of cardiovascular disease (CVD), including myocardial infarction, heart failure, stroke, transient ischemic attack, diabetes, blood lipid disorders, or chronic kidney disease.

- Risky habits including smoking, alcohol consumption, unhealthy eating patterns, and low physical activity.
- Psychosocial Aspects, among them are stress, depression, and other psychological conditions.
- Family history of early CVD, hypercholesterolemia, or diabetes.

c. Symptoms/signs of hypertension/comorbid disease

Several symptoms or signs related to hypertension and its comorbid conditions include :

- Shortness of breath, chest pain, and palpitations.
- Swelling in the legs or arms (peripheral edema).
- Headache, blurred vision, and dizziness.
- Frequently waking up at night to urinate (nocturia) or blood in urine (hematuria).
- Pain during activity due to impaired blood circulation (claudication).

d. Symptoms indicating secondary hypertension

Signs that may indicate secondary hypertension include :

- Muscle disorders : Muscle weakness, cramps, or tetany related to conditions such as hypokalemia or primary aldosteronism.
- Heart problems : Arrhythmia or flash pulmonary edema due to renal artery stenosis.
- Hormonal disorders : Excessive sweating, palpitations, and frequent headaches, such as in pheochromocytoma.

- Sleep disorders : Snoring and excessive daytime sleepiness related to obstructive sleep apnea.
- Thyroid-related symptoms : Indications of thyroid function problems that may underlie hypertension.

2. Physical Examination

   A comprehensive physical examination is vital in diagnosing hypertension and identifying organ damage caused by it by hypertension (HMOD) or the possibility of secondary hypertension (Dwi Pramana, 2020). The following examination involves :

   a. Circulation and heart
      - Checking pulse, rhythm, and character of the pulse.
      - Observing pressure or pulse of the jugular vein.
      - Assessing apex beat, additional heart sounds, and the presence of basal rales or peripheral edema.
      - Listening for bruit sounds in the carotid, femoral, and abdominal areas, and checking for radiofemoral delay.

   b. Other organs/systems
      - Checking if the kidneys are enlarged.
      - Noting signs of obstructive sleep apnea, including a neck circumference exceeding 40 cm.
      - Detecting thyroid enlargement.
      - Assessing body mass index (BMI), waist circumference, or the presence of fat deposits.

- Recording the presence of colored striae that may be related to disease or Cushing's syndrome.

3. Laboratory Examination and ECG
    a. Blood tests : Including measurement of sodium, potassium, creatinine levels in serum, and estimation of glomerular filtration rate (eGFR). If possible, lipid profile and fasting glucose are also examined.
    b. Urine tests : Urine examination using dipstick method.
    c. 12-lead ECG : To detect the presence of atrial fibrillation, left ventricular hypertrophy (LVH), or signs of ischemic heart disease.

2.1.4 Classification Of Hypertension

Hypertension can be classified into two types based on its causes, namely primary hypertension and secondary hypertension. Primary hypertension, often known as essential hypertension, occurs when blood pressure continuously rises due to disturbances in the body's homeostatic regulation mechanisms. This type of hypertension accounts for about 95% of all hypertension cases. Many aspects that plays a role in essential hypertension influenced by various factors, including environmental conditions, activity of the renin-angiotensin system, genetic factors, excess activity of the sympathetic nervous system, problems in sodium excretion, as well as increased levels of sodium and potassium in cells, obesity, and smoking habits (Ayu, 2021).

Primary and secondary hypertension have fundamental differences. Secondary hypertension, also called renal hypertension, is related to disorders in hormone secretion and kidney function. This type of hypertension accounts for

about 10% of all hypertension cases. Some common causes include kidney disease, renal vascular hypertension, estrogen use, primary hyperaldosteronism, Cushing's syndrome, and hypertension that occurs during pregnancy. Fortunately, most cases of secondary hypertension can be managed through appropriate treatment in addressing the underlying causes (Diartin et al., 2022).

Hypertension can be divided into three categories based on its type: systolic hypertension, diastolic hypertension, and mixed hypertension. Systolic hypertension occurs when systolic pressure increases, while diastolic pressure remains normal. This condition is often found in older individuals. Systolic pressure reflects the pressure in the arteries when the heart pumps blood, which is the highest pressure and is indicated as the top number in blood pressure measurements. Diastolic hypertension, on the other hand, occurs when diastolic pressure increases without an increase in systolic pressure. This type of hypertension is more commonly found in children and young adults. The cause is abnormal narrowing of blood vessels, which increases diastolic pressure and adds resistance to blood flow. Diastolic pressure reflects the pressure in the arteries when the heart is resting between beats. Meanwhile, mixed hypertension is a condition where both systolic and diastolic pressures increase simultaneously. This type indicates higher pressure in both phases, both when the heart pumps and during relaxation (Warjiman et al., 2020).

Hypertension can be divided based on symptoms into two types: benign hypertension and malignant hypertension. Benign hypertension generally does not show clear symptoms and is often detected accidentally during routine

examinations. Conversely, malignant hypertension is characterized by a medical emergency due to serious complications in vital organs including the heart, brain, or kidneys (Hastuti, 2022). Based on various guidelines, hypertension can also be further classified into several categories :

1. Classification of Hypertension from JNC 7

   The 7th Joint National Committee (JNC) is the result of a team effort by the Executive Committee of the National High Blood Pressure Education Program, which involves 46 experts, volunteers, and government agencies. The JNC 7 blood pressure classification, which has been assessed by 33 leading hypertension experts in the United States, is shown in the following table.

Table 2. 1 Classification Of Hypertension From JNC 7

Blood Pressure Category	**SBP (mmHg)**		**DBP (mmHg)**
Normal	< 120	And	< 80
Pre-hypertension	120 – 139	Or	80 – 89
Grade 1 Hypertension	140 – 159	Or	90 – 99
Grade 2 Hypertension	> 160	Or	> 100
Isolated systolic hypertension	> 140	And	< 90

Isolated systolic hypertension is characterized by systolic blood pressure (SBP) ≥140 mmHg and diastolic blood pressure (DBP) ≤90 mmHg. The following condition is one of the most common forms of essential hypertension, both in young and old age. In young age groups, including children, adolescents, and young adults, this type of hypertension is quite often detected. Meanwhile, in the elderly, isolated systolic hypertension often occurs due to stiffness in large arteries that increase pulse

pressure (the difference between systolic and diastolic pressure). Individuals diagnosed with hypertension, either at level 1 or level 2, require appropriate pharmacological treatment.

Considering the increasing number of difficult-to-control hypertension cases, the American College of Cardiology (ACC), American Heart Association (AHA), along with nine other organizations, has updated the classification of hypertension based on systolic and diastolic blood pressure measurements to :

Table 2. 2 Classification Of Hypertension From ACC/AHA

Blood Pressure Category	**SBP (mmHg)**		**DBP (mmHg)**
Normal	< 120	And	< 80
Pre-hypertension	120 – 129	Or	< 80
Grade 1 Hypertension	130 – 139	Or	80 – 89
Grade 2 Hypertension	≥ 140	Or	≥ 90

2. Classification From WHO (*World Health Organization*)

WHO and the International Society of Hypertension Working Group (ISHWG) classify hypertension into optimal, normal, high normal, mild, moderate, and severe categories. At the First National Scientific Meeting of the Indonesian Hypertension Association on January 13 – 14, 2007, it was concluded that there is currently no hypertension classification specifically adjusted for the Indonesian population. This is due to the lack of national-scale hypertension research data in Indonesia. Therefore, the Indonesian Nephrology Association (Pernefri) chose to adopt the WHO/ISH hypertension classification, as it is considered more general and has been widely applied.

Table 2. 3 Classification Of Hypertension From WHO

Category	Systolic Blood Pressure (SBP)	Diastolic Blood Pressure (DBP)
Optimal	< 120	<80
Normal	< 130	< 85
Normal-High	130-139	85-89
Grade 1 (mild hypertension)	140-159	90-99
Sub-group : borderline	140-149	90-94
Grade 2 (moderate hypertension)	160-179	100-109
Grade 3 (severe hypertension)	≥ 180	≥ 110
Isolated systolic hypertension	≥ 140	< 90
Sub-group : borderline	140-149	< 90

The majority of hypertension sufferers are in the mild category, where the main step to overcome it is by implementing lifestyle changes. However, medicine therapy is still needed to keep blood pressure under control. Meanwhile, individuals with moderate and severe hypertension face a higher risk of heart attack, stroke, and damage to other vital organs. The following high risk is caused by the presence of more than three accompanying hypertension triggers.

2.1.5 Signs And Symptoms Of Hypertension

Hypertension often presents without clear symptoms. Some symptoms that may be felt include headaches, a hot sensation in the nape of the neck, or a heavy head. However, the following symptoms cannot be used as a definite reference to detect hypertension. The most effective way to find out is to regularly check your blood pressure. Many people only realize that they have hypertension after damage occurs to organs of the body, including coronary heart disease, stroke, or kidney failure (Sudarmin et al., 2022).

Clinical symptoms often experienced by hypertension sufferers include dizziness, irritability, ringing in the ears, difficulty sleeping, shortness of breath, a feeling of heaviness in the neck, fatigue, flashing eyes, and nosebleeds. However, hypertension often does not indicate signs for years. The symptoms that appear generally reflect damage to blood vessels, depending on the organ affected. For example, in the kidneys, nocturia (frequent urination at night) and azotemia (increased levels of creatinine and urea nitrogen in the blood) can occur. If the blood vessels of the brain are involved, complications including stroke or transient ischemic attacks can occur, the main sign of which is temporary paralysis affecting one side of the body (hemiplegia) or sharp disturbances in vision (Sudarmin et al., 2022).

2.1.6 Pathophysiology Of Hypertension

The Angiotensin I Converting Enzyme (ACE) plays a role in converting angiotensin I to angiotensin II, which has important physiological functions in regulating blood pressure and can trigger hypertension. In the liver, angiotensinogen is produced and released into the blood. Renin, an enzyme produced by the kidneys, converts angiotensinogen into angiotensin I. Subsequently, in the lungs, ACE converts angiotensin I to angiotensin II. The following angiotensin II contributes to the increase in blood pressure through two main mechanisms.

First, there is an increase in the secretion of the antidiuretic hormone (ADH) and thirst. ADH, produced by the hypothalamus or pituitary gland, plays a role in regulating the volume and concentration of urine through its effects on the kidneys.

When ADH levels increase, the amount of urine produced decreases (antidiuresis), making the urine more concentrated with high osmolarity. This process draws fluid from inside the cells (intracellular) to outside the cells (extracellular) to dilute that fluid. Thus, blood volume increases, leading to an increase in blood pressure.

Second, there is an increase in the secretion of the steroid hormone aldosterone from the adrenal cortex. Aldosterone plays an important role in the kidneys by helping to reabsorb sodium chloride (salt) from the renal tubules, thereby reducing the amount of extracellular fluid that is excreted. This also contributes to the increase in blood pressure. The increase in extracellular fluid volume helps to dilute the high concentration of sodium chloride, but it also causes an increase in blood pressure. Essential hypertension is a very complex condition with various causative factors. Several factors that influence blood pressure function to ensure optimal blood flow to tissues include hormonal mediators, blood vessel conditions, circulating blood volume, blood vessel diameter, blood viscosity, cardiac output, blood vessel elasticity, and nerve stimulation. Some main factors that can trigger essential hypertension include genetic factors, salt consumption patterns in the diet, and stress levels, all of which contribute to the emergence of hypertension symptoms (Prayitnaningsih et al., 2021).

2.1.7 Complications Of Hypertension

Hypertension, or high blood pressure, can damage the inner lining of blood vessels (endothelium) and accelerate the development of atherosclerosis. The following condition is a major triggering factor that contributes to cerebrovascular disease, including stroke and transient ischemic attack (TIA). In addition,

hypertension also increases the likelihood of coronary heart disease, including heart attacks (myocardial infarction) and chest pain (angina), kidney failure, dementia, and arrhythmias including atrial fibrillation.

When the body has other cardiovascular risk factors, the impact of hypertension will be greater, leading to an increased risk of serious diseases, which results in higher mortality and morbidity rates (Rikmasari & Noprizon, 2020).

Uncontrolled hypertension can pose a serious threat as it has the potential to cause various complications that disrupt the function of other organs (Anshari, 2020). Here are some impacts and complications that can be caused by hypertension:

1. Stroke

   Stroke, also known as Cerebrovascular Accident (CVD) or brain attack, occurs due to a disruption of blood flow to the brain that occurs suddenly. Hypertension can trigger brain bleeding due to blood clots in blood vessels (thrombosis) or the rupture of blood vessel walls (hemorrhagic stroke). In addition, ischemic stroke can occur if the blood flow to part of the brain stops or significantly decreases, it results in brain tissue damage (Hanum et al., 2018).

2. Coronary Heart Disease

   Hypertension directly impacts the heart by increasing blood pressure, which exerts greater pressure on the walls of the arteries. If the following condition persists continuously, the inner layer of blood vessels (endothelium) can experience damage, triggering the occurrence of

atherosclerosis. High blood pressure and atherosclerosis are interrelated, as changes in the walls of blood vessels due to atherosclerosis can worsen the condition of the vessels. As a result, the heart's workload increases, causing the left ventricular muscle to thicken (hypertrophy). This thickening reduces the space within the heart, so the heart needs to work harder to pump blood throughout the body, which ultimately increases the overall burden on the heart (Naomi et al., 2021).

3. Kidney Failure

Fibrosis and hyalinosis of the vessel walls are signs of long-term hypertension, which can lead to structural changes in the arteries throughout the body. Nephrosclerosis, a disease caused by ischemia due to the narrowing of the lumen of intrarenal blood vessels and occlusion of arterioles and arteries, is a result of atherosclerosis caused by hypertension in the kidneys. The blockage causes damage to the glomerular blood vessels and tubular atrophy. As a result, the number of active nephrons decreases, although nephron damage increases as nephron function progresses (Masi & Kundre, 2018).

4. Vision Disorders

Hypertension can affect vision, ranging from blurred vision to blindness, often marked by the rupture of blood vessels in the eyes. High blood pressure can also trigger eye disorders, including hypertensive retinopathy, which is damage to the retinal nerves due to high blood pressure affecting blood vessels in that area (Adam, 2019).

2.1.8 Management Of Hypertension

The management of hypertension aims to prevent complications and lower blood pressure to normal levels, or at least to the lowest level that is still acceptable for the patient (Kartikasari & Afif, 2021). Management efforts includes :

1. General management. The following approach aims to reduce the risk of hypertension without the use of medications, including :
    a. Low salt diet, with guidelines as follows :
        1) Patients whose weight reaches 115% or more of ideal weight are advised to follow a low-calorie diet and exercise regularly to meet energy needs.
        2) Ensure adequate protein intake according to individual needs.
        3) Adjust carbohydrate consumption to daily needs.
        4) Reduce saturated fat and cholesterol intake in food.
        5) Limit sodium intake to a maximum of 800 mg per day.
        6) Magnesium intake must meet daily needs based on Dietary Reference Intakes (DRI), with additional magnesium supplements of 240 – 1000 mg per day if necessary.
    b. Low fat diet, to maintain vascular health.
    c. Stop smoking and alcohol consumption, to maintain blood pressure stability.
    d. Reduce body weight to achieve a healthy nutritional balance.
    e. Regular exercise, which helps improve blood circulation and lower peripheral pressure.

2. Management with medications. When lifestyle changes are not sufficient, medications can be applied to control blood pressure, including :
    a. Diuretics, to reduce body fluid retention.
    b. Sympathetic inhibitors, which suppress the activity of the sympathetic nervous system.
    c. Block ganglion, which inhibits the transmission of certain nerve signals.
    d. Angiotensin I Converting Enzyme (ACE) inhibitors, to prevent the formation of angiotensin II that triggers an increase in blood pressure.
    e. Calcium antagonists, which work to relax blood vessels and help lower blood pressure.

From the Hypertension Management Consensus (2019) published by the Indonesian Hypertension Doctors Association, the management of hypertension involves :

1. Lifestyle Intervention

    A healthy lifestyle can reduce or prevent stage 1 hypertension and can reduce the risk of cardiovascular disease. However, with a healthy lifestyle, it is advisable not to delay medicine therapy for patients with target organ damage due to hypertension (HMOD) or those with a high risk of cardiovascular disease. There is evidence that a healthy lifestyle can stabilize blood pressure by reducing salt and alcohol consumption, consuming more vegetables and fruits, losing weight and maintaining an ideal weight, engaging in regular physical activity, and avoiding smoking.

Adopting a healthy lifestyle can help prevent stage 1 hypertension while also reducing the risk of cardiovascular disease. However, in patients with organ damage due to hypertension (Hypertension Mediated Organ Damage or HMOD) or high risk of cardiovascular disease, lifestyle intervention should not delay the provision of medicine therapy.

Lifestyle adjustments that have been proven effective in stabilizing blood pressure, by :

- Reducing salt and alcohol consumption.
- Increasing vegetable and fruit intake.
- Stabilizing weight and maintaining an ideal weight.
- Engaging in regular physical activity.
- Avoiding smoking habits.

The following healthy lifestyle not only helps control blood pressure but also improves overall health.

2. Salt Consumption Restriction

There is evidence that salt consumption and hypertension are related. Evidence has been found that high salt consumption can increase blood pressure and the prevalence of hypertension. It is advisable not to apply sodium (Na) more than 2 grams per day. This is equivalent to 5-6 grams of sodium chloride or 1 teaspoon of table salt. Therefore, it is better not to consume foods that are high in salt.

3. Dietary Changes

Hypertension sufferers are advised to adopt a healthy diet by reducing the consumption of red meat and saturated fatty acids. Instead, it is recommended to consume more vegetables, legumes, fresh fruits, low-fat dairy products, whole grains, fish, and unsaturated fatty acids, especially those found in olive oil. This diet helps support blood pressure control while improving heart health.

4. Weight Loss and Maintaining Ideal Weight

   Based on Riskesdas 2018 data, the obesity rate among adults in Indonesia increased from 14.8% in 2013 to 21.8% in 2018. Weight control, including regularly measuring waist circumference, aims to prevent obesity (with a Body Mass Index or BMI greater than 25 kg/m^2) and achieve an ideal weight with a BMI range of 18.5 – 22.9 kg/m^2.

5. Quitting Smoking

   Smoking is one of the main risk factors for vascular diseases and cancer. Therefore, smoking status should be inquired about in every visiting patient. For hypertensive patients who smoke, education about the importance of quitting smoking should be provided, as this habit can increase the risk of serious complications, including heart disease and cancer.

6. Determination of Blood Pressure Limits for Initiation of Medication

   The treatment of hypertension with medications aims to stabilize blood pressure optimally. However, the administration of antihypertensive medicines is not always the first step in managing high blood pressure. The

treatment approach is adjusted according to the patient's condition and the severity of their hypertension (PERHI, 2019).

Table 2. 4 Blood Pressure Thresholds For Initiation Of Medication

Age Group	**SBP Threshold In Clinic For Initiation Of Medication (mmHg)**					**SBP In Clinic (mmHg)**
	Hypertension	+Diabetes	+CKD	+CHD	+Stroke /TIA	
18-65 Years	≥ 140	≥ 140	≥ 140	≥ 140	≥ 140	≥ 90
65-79 Years	≥ 140	≥ 140	≥ 140	≥ 140	≥ 140	≥ 90
≥ 80 Years	≥ 160	≥ 160	≥ 160	≥ 160	≥ 160	≥ 90
SBP In Clinic (mmHg)	≥ 90	≥ 90	≥ 90	≥ 90	≥ 90	

Source : (ESC/ESH Hypertension Guidelines, 2018; PERHI, 2019)

Information :

Description:

BP : blood pressure

DBP : diastolic blood pressure

SBP : systolic blood pressure

CKD : chronic kidney disease

CHD : coronary heart disease

TIA : transient ischemic attack

2.2 Basic Concepts Of The Dietary Approaches To Stop Hypertension (DASH) Diet

2.2.1 Definition Of DASH Diet

The DASH (Dietary Approach to Stop Hypertension) diet is a healthy eating pattern created to help stabilize blood pressure and cholesterol levels. The following

diet is based on the principles of consuming nutritious foods that are not only effective in stabilizing blood pressure but also reduce the risk of serious diseases including cancer, stroke, and heart disease.

With the following diet, people with hypertension can achieve and maintain their ideal body weight. The DASH diet does not prohibit certain foods, but rather encourages a healthy and balanced diet.

Research on the Dietary Approach to Stop Hypertension (DASH) diet indicates that the following diet is rich in potassium, calcium, and magnesium, which are effective in lowering blood pressure. By routinely consuming vegetables, fruits, and low-fat dairy products that are low in saturated fat and total fat, the following diet can stabilize systolic pressure by 6-11 mmHg and diastolic by 3-6 mmHg (Kemenkes RI, 2023b).

The DASH diet is a dietary approach designed to help people with hypertension reduce their salt intake while increasing their consumption of healthy foods including high-fiber vegetables and fruits, low-fat milk, nuts, and meat (Anggorodiputro, 2022). The following diet also highlights the importance of potassium, calcium, and magnesium intake which are abundant in fruits and vegetables (Falah & Apriana, 2023).

The high-fiber, low-fat diet known as DASH is a non-pharmacological method for managing hypertension. The following diet is designed to follow heart health guidelines by limiting consumption of saturated fat, cholesterol, sodium, and salt. Based on the principles of the DASH diet, the following diet is believed to be

effective in preventing and treating high blood pressure (Fitriyana & Karunianingtyas, 2022).

The DASH diet has been shown to be effective in helping people with hypertension encourage increased intake of potassium, calcium, and magnesium. The following diet is not burdensome or extreme because it still prioritizes a balanced diet that is rich in these important minerals. In addition, the food ingredients needed in the DASH diet are easily available anywhere (Nurmayanti & Kaswari, 2022).

2.2.2 DASH Diet Principles

The DASH diet is designed to prevent and control hypertension by referring to five main principles of diet (National Institutes of Health, 2006), namely :

a. Consumption of fruits and vegetables that contain potassium, phytoestrogens and fiber

   Foods including bananas, mangoes, and young coconut water that are rich in potassium help increase potassium concentrations in intracellular fluids. This draws fluid from the extracellular part so that it can stabilize blood pressure, while maintaining the balance of sodium and potassium in the body. Phytoestrogens play a role in preventing symptoms of hot flashes or burning sensations in menopausal women and reducing the risk of certain cancers. Fiber, in addition to helping clean the digestive tract and making it easier to defecate, also affects the absorption of nutrients in the intestines. The following fiber content also provides important benefits in preventing colon cancer.

b. Consumption of low-fat dairy products

Low-fat milk that is rich in calcium is recommended for people with hypertension. Calcium helps regulate the function of hormones and growth factors in body fluids, both extracellular and intracellular. In addition, calcium plays a role in nerve transmission, muscle contraction, blood clotting, and maintaining the permeability of cell membranes. Elderly women are also advised to consume low-fat milk to get additional calcium, protein, vitamins, and minerals.

c. Consume fish, nuts, and poultry in moderation

Protein from fish, nuts, and poultry supports body balance by helping to maintain water levels, forming antibodies, maintaining body neutrality, and transporting important nutrients.

d. Reduce saturated fat (Saturated Fatty Acid/SAFA)

Reducing the consumption of saturated fats including uric acid, palmitic acid, and stearic acid is very important because of its atherogenic properties. The following saturated fats, often found in red meat, lard, coconut oil, chocolate, cheese, cream, and butter, can trigger arteriosclerosis, which is the accumulation of fat in the blood vessels that contributes to increased blood pressure.

e. Limit sugar and salt

Reducing sugar and salt intake can help prevent high blood pressure, edema, and heart disease. A low-salt diet involves reducing sodium from

various sources, including table salt, baking powder, MSG, flavorings, and food preservatives (for example in sauces, soy sauce, jam, and jelly).

- The Indonesian Ministry of Health provides guidelines for a low-salt diet :
  - Light diet : 3.75–7.5 grams of salt per day.
  - Medium diet : 1.25–3.75 grams of salt per day.
  - Strict diet : less than 1.25 grams of salt per day.
- WHO recommends a maximum sodium intake of 2,300 mg per day (about 1 tsp of salt), while the DASH diet is stricter, limiting sodium to 1,500 mg per day.

2.2.3 DASH Diet Requirements

From the National Institute of Health, the food ingredients in the DASH diet pattern come from fresh and natural ingredients that have not gone through industrial processing. The following makes the sodium content relatively lower (National Institutes of Health, 2006). The requirements for the DASH diet are as follows :

1. If want to lose weight, reduce calorie intake and increase physical activity according to the body's energy needs based on age and activity level.
2. Total fat: As much as 27% of total calorie needs.
3. Saturated fat: Only 6% of total calories.
4. Protein: Worth 18% of total calories.
5. Carbohydrates: Contribute 55% of total calories.
6. Cholesterol: No more than 150 mg per day.

7. Sodium: Maximum 2300 mg per day.
8. Potassium: As much as 4700 mg per day.
9. Calcium: Reaching 1250 mg per day.
10. Magnesium: Worth 500 mg per day.
11. Fiber: Recommended as much as 30 g per day.

From the Indonesian Ministry of Health, the first step in implementing the DASH diet is to calculate the energy and nutritional needs of each individual, because dietary planning is different for each person. After the energy and nutritional needs are known, the portion or amount of food that is in line with the principles of the DASH diet can be designed. The following diet is known to be effective in preventing and controlling hypertension, especially in the elderly (Kemenkes RI, 2023a). The following are the requirements that need to be considered in implementing the DASH diet :

1. Follow the Nutritional Adequacy Rate (AKG) to ensure that carbohydrate, energy, and protein intake meets the body's needs.
2. Limit consumption of sugar and artificial sweeteners, which is no more than 54 grams or around 4 tablespoons per day.
3. Reduce foods high in cholesterol and saturated fat, with a maximum limit of 72 grams or around 5 tablespoons per day.
4. Limit salt or sodium consumption, which is only 1,500–2,300 mg or around 1 teaspoon per day.
5. Increase intake of potassium-rich foods, with a target of 4,700 mg per day, and meet calcium needs (>800 mg per day), magnesium (according to

AKG), fiber (30 g per day), and consume 4–5 servings of fruit and vegetables per day.

2.2.4 Composition Of Food In The DASH Diet (Serving)

The DASH eating pattern is designed for an intake of 2,000 calories per day. However, the portion sizes from each food group may vary depending on individual calorie needs.

Table 2. 5 Composition Of Foods In The DASH Diet

Food Ingredients	Daily Portion	Serving Size	Examples and Notes	Meaning of Each Food Ingredient for the DASH Eating Pattern
Grains [1)] [1)] Most wheat-based dishes should use whole wheat, as it is rich in fiber and beneficial nutrients.	6-8	1 slice of bread 1 ounce of dry cereal [2)] ½ cup of cooked rice, pasta, or cereal [2)] Serving sizes for cereals vary, usually between ½ and 1¼ cups, depending on the type. Be sure to check the nutrition label or Nutrition Facts on the package for more information.	Whole wheat bread and rolls, whole wheat pasta, English muffins, pita bread, bagels, cereal, cornmeal, oatmeal, brown rice, plain pretzels, and popcorn	Are the main sources of fiber and energy for the body
Vegetables	4-5	1 cup raw leafy greens ½ cup raw or cooked	Broccoli, carrots, collards, green beans, peas, kale, lima beans, potatoes, spinach,	Rich in fiber, potassium, and magnesium which are

		chopped greens ½ cup vegetable juice	pumpkin, sweet potatoes, tomatoes	beneficial for the body
Fruits	4-5	1 medium fruit ¼ cup dried fruit ½ cup fresh, frozen, or canned fruit ½ cup fruit juice	Apples, apricots, bananas, dates, grapes, oranges, grapefruit, grapefruit juice, mangoes, melons, peaches, pineapples, raisins, strawberries, tangerines	Contains fiber, potassium, and magnesium which are essential for the body
Milk and fat-free or low-fat milk products	2-3	1 cup milk or yogurt 1½ ounces cheese	Milk or buttermilk without fat (skim) or low fat (1%), fat-free or low-fat cheese, plain yogurt or frozen yogurt without fat or low fat	It is the main source that is rich in protein and calcium
Lean meat, poultry, and fish	6 or less	1 ounce cooked meat, poultry, or fish 1 egg [3]) [3]) Limit your consumption of egg yolks to a maximum of four per week due to their high cholesterol content. Alternatively, one ounce of meat contains the same amount of protein as two egg whites.	Choose only lean meats; trim off visible fat; bake, grill, or boil; remove skin from poultry	Contains magnesium and protein in high amounts
Nuts, seeds, and legumes	4-5 per week	⅓ cup or 1½ ounces nuts	Almonds, hazelnuts, mixed nuts, peanuts,	It is a rich source of energy,

		2 tablespoons peanut butter 2 tablespoons or ½ ounces seeds ½ cup cooked legumes (dried beans and peas)	walnuts, sunflower seeds, peanut butter, kidney beans, lentils, peas	magnesium, protein and fiber
Fats and oils [4] [4] The serving size of fats and oils is adjusted based on their fat content. For example, one tablespoon of regular salad dressing counts as one serving; one tablespoon of low-fat dressing counts as half a serving; while one tablespoon of fat-free dressing does not count as a serving.	2-3	1 tsp soft margarine 1 tsp vegetable oil 1 tbsp mayonnaise 2 tbsp salad dressing	Soft margarine, vegetable oil (including canola oil, corn oil, olive oil, or sunflower oil), low-fat mayonnaise, light salad dressing	From the DASH study, around 27 percent of calorie intake comes from fat, either naturally contained in food or added during processing or serving
Sweets and added sugar	5 or less, per week	1 tbsp sugar 1 tbsp jelly or jam	Fruit flavored gelatin, fruit drinks, hard/solid candy, jellies,	Choose sweet snacks that are low in fat content

	½ cup sorbet, gelatin 1 cup lemonade	maple syrup, sorbets and ices, sugar

Source : National Institute of Health, 2006

2.2.5 Food Arrangement In DASH Diet

Based on guidelines from the National Institute of Health, here are the recommended eating patterns in the DASH diet :

Table 2. 6 Food Arrangement In DASH Diet

	Food Arrangement
Recommended food ingredients	• Fresh food: Choose sources of vegetable and animal protein, as well as vegetables and fruits that are rich in fiber. • Minimal salt: Use little or no salt/sodium, MSG, or powdered broth when processing food. • Animal protein: Consume at least 100 grams of meat, chicken, or fish per day, and one chicken or duck egg every day. • Milk: Drink 200 milliliters of fresh milk per day.
Restricted food ingredients	• Table salt: Limit the use of salt in cooking. • Foods high in sodium: Avoid ingredients such as baking soda which contain sodium. • Sugar: Consume sweet foods to a maximum of five servings per week. • Fats and oils: Limit the use of fats and oils to two to three servings per day.
Foods to avoid	• Canned foods: Avoid sardines, sausages, corned beef, vegetables, or fruits in cans. • High-sodium foods: Limit consumption of crackers, pastries, crackers, chips, and other foods cooked with excess salt. • Preserved foods: Avoid jerky, shredded meat, salted fish, dried shrimp, salted eggs, and the like. • High-fat dairy products: Limit butter and cheese.

	• High-risk seasonings: Reduce soy sauce, salt, sauce, tomatoes, shrimp paste, chili sauce, tauco, and the like. • Fermented and alcoholic foods: Avoid durian, tape, and other fermented foods or drinks.

Source : National Institute of Health, 2006

In the DASH diet, it is recommended to choose fresh or processed foods without added salt, MSG, or powdered broth. If the taste of the food is not savory enough, you can apply shallots, garlic, ginger, or other salt-free spices as an alternative. Avoid foods cooked or preserved with salt, and limit the use of sugar or sweets to a maximum of five tablespoons per week.

In addition, other sources emphasize that, in the implementation of the DASH diet, there are foods that are recommended and not recommended for consumption. From the Indonesian Ministry of Health in 2023, these foods include:

1. Recommended food ingredients
    - Carbohydrate sources: white rice, brown rice, taro, potatoes, cassava, oats, cereals, and whole wheat.
    - Fat: unsalted butter and palm oil.
    - Animal protein: skinless poultry, fish, and eggs (maximum 1 per day).
    - Fresh nuts.
    - Vegetables and fruits.
    - Drinks: water, low-fat milk, fruit juice, and tea with a controlled sugar content.
    - Seasonings: fresh herbs, natural spices, and table salt in limited quantities.

2. Food ingredients that are not recommended

- Carbohydrates: uduk rice, biscuits preserved with salt, and sweet or savory cakes.
- Fats: butter, margarine, and mayonnaise.
- Nuts: processed nuts with added salt or preservatives.
- Vegetables and fruits: canned products, sweets, and pickles.
- Drinks: packaged drinks high in preservatives and sweeteners, full cream milk, and alcohol.
- Instant seasonings: soy sauce, sauce, MSG, and ready-to-use seasonings.
- Processed meat: fatty red meat, sausages, canned fish, smoked fish, offal, nuggets, corned beef, and processed meat containing salt.

2.2.6 DASH Diet Assistance

2.2.6.1 Definition of DASH Diet Assistance

DASH (Dietary Approaches to Stop Hypertension) diet assistance is a support process provided to individuals with hypertension, to implement a healthy diet that aims to lower blood pressure. The DASH diet focuses on increasing the consumption of fruits, vegetables, grains, low-fat dairy products, and reducing the intake of salt and foods high in saturated fat.

2.2.6.2 DASH Diet Assistance Objectives

a. Lowering Blood Pressure

Help each individual achieve and maintain healthy blood pressure.

b. Increasing Diet Compliance

Encourage each individual to follow the DASH diet guidelines consistently.

c. Improving Quality of Life

Reduce the risk of hypertension-related health complications and improve overall quality of life.

d. Nutrition Education

Provide a better understanding of the importance of a healthy diet and how to choose the right foods.

2.2.6.3 DASH Diet Assistance Steps

1. Initial Assessment: Collecting data on health conditions, dietary history, and eating habits of each individual.
2. Nutrition Education: Providing information about the DASH diet, including its benefits and the types of foods that are recommended and those that should be avoided.
3. Diet Planning: Helping each individual plan a daily menu that is in accordance with the principles of the DASH diet, including the application of recipes and food choices.
4. Providing Guidance: Providing practical guidance on how to shop, cook, and serve healthy food.
5. Monitoring and Evaluation: Conducting regular monitoring of blood pressure and dietary compliance, and providing feedback for improvement.
6. Ongoing Support: Offering emotional support and motivation to help each individual stay committed to the planned diet.

2.2.6.4 DASH Diet Assistance Methods

1. Individual Approach

   Assistance is carried out personally, considering the needs and preferences of each individual.

2. Educational Sessions

   Holding group or individual educational sessions on nutrition, the benefits of the DASH diet, and how to implement it.

3. Providing Educational Materials

   Providing leaflets, guides, and recipes related to the DASH diet to strengthen understanding.

4. Family-Based Approach

   Gathering support from family members to create an environment that supports the implementation of the DASH diet.

5. Monitoring and Feedback

   Conducting routine evaluations of blood pressure and diet progress, and providing constructive feedback.

2.3 Basic Concepts Of The Elderly

2.3.1 Definition Of The Elderly

Elderly or elderly is a stage of life marked by aging, where the function of body organs including the brain, heart, liver, and kidneys begins to decline. In addition, the elderly also experience the loss of active tissue including muscles, so that the body becomes more susceptible to various diseases that can lead to death. Based on Law Number 13 of 1998 concerning the Welfare of the Elderly, a person

is categorized as elderly if they are 60 years of age and over. Globally, the number of elderly population is expected to continue to increase. From WHO (2013), the elderly category is divided into five groups: middle age (45-54 years), elderly (55-65 years), young elderly (66-74 years), old elderly (75-90 years), and very old elderly (over 90 years) (Wulandari et al., 2023).

Aging is a natural part of human life that occurs over time. The following process can begin at any time, even from an early age. In the journey of life, humans go through three main stages: childhood, adulthood, and old age (Mawaddah & Wijayanto, 2020).

Elderly is a natural stage in life that occurs when someone enters the final phase of their life, usually starting at the age of 60 and above. The aging process occurs gradually and affects the functions and abilities of the body as a whole. Signs of healthy elderly include the ability to carry out basic daily activities independently, including maintaining personal hygiene, eating, drinking, moving, dressing, and maintaining general health. Therefore, maintaining independence in daily activities is a key factor in improving the quality of life for the elderly (Mawaddah & Wijayanto, 2020).

2.3.2 Aging Process

Aging is a natural process that occurs as one gets older, where a person experiences changes and a decline in the functions of body organs. This process is influenced by two main factors. First, genetic factors, which include DNA repair capabilities, response to stress, and the body's protective mechanisms against free radicals. Second, environmental factors, including calorie intake, diseases, and

exposure to external stress such as radiation and chemicals. Both of these factors contribute to cellular metabolic activities that produce oxidative stress, thereby accelerating the aging process (Sunaryo et al., 2016).

2.3.2.1 Theories Of The Elderly

Health experts explain that human aging can be explained through two main approaches: biological theory and psychological theory. Here are some biological theories that explain the aging process :

1. Biological Theory
    - Genetic Theory

        Aging is considered a process that is genetically programmed. The following occurs due to biochemical changes in DNA that regulate body functions. For example, mutations in reproductive cells cause a decline in the functional capacity of cells over time (Muhith & Siyoto, 2016).

    - Cellular Theory

        Body cells have a limited number of divisions, usually up to 50 times. When elderly cells are taken from the body and cultured in the laboratory, their ability to divide significantly decreases. This provides insight into how biological aging occurs and indicates that limited cell division restricts growth and tissue repair as age increases (Azizah, 2011).

    - Free Radical Theory

Free radicals are formed both from the environment and as a result of the body's metabolism. These substances are highly reactive and can damage DNA, proteins, or fatty acids, thus posing potential dangers. Although the body has mechanisms to neutralize free radicals, some still remain and increase with age. Cell damage due to free radicals gradually leads to cell death and loss of regenerative capacity (Safari & Marlina, 2015).

- Somatic Mutation Theory

  The environment plays an important role in triggering somatic mutations in cells. Exposure to radiation or chemicals is known to accelerate aging, while avoiding them can prolong life. Continuous DNA mutations occurring in somatic cells lead to a decline in the cells' ability to perform optimally (Safari & Marlina, 2015).

2. Psychological Theory

- Activity Theory

  This theory asserts that people who are active in their youth tend to remain active into old age. Responsible and active habits developed since youth help them live a life full of social involvement. Elderly people who are active in various social activities are considered to be aging successfully. This theory also emphasizes the importance of maintaining stable social relationships from adulthood to old age (Azizah, 2011).

- Continuity Theory

A person's basic personality or behavioral patterns generally remain stable into old age. Elderly individuals with a strong sense of self tend to find it easier to maintain social relationships, engage in various societal issues, and sustain bonds with family and their surrounding environment. From this theory, a person's personality type plays a significant role in determining how they face changes in old age (Muhith & Siyoto, 2016).

A person's behavior tends to remain consistent as they age. Elderly individuals with a strong identity are better able to maintain social relationships, contribute to society, and face various challenges within their family and environment. This theory emphasizes that a person's personality type has an important role in determining how they experience changes in old age (Muhith & Siyoto, 2016).

- Disengagement Theory

The occurrence of disconnection with others, including the community environment and the outside world, is a characteristic of the aging process. From this theory, as age increases, individuals slowly begin to withdraw from their social life. As a result, social interaction in the elderly decreases, both in terms of quality and quantity, until double losses often occur, including loss of role, limited social contact (restriction of contacts and relationships), and lack of commitment to social values (reduced commitment to social mores and values) (Azizah, 2011).

2.3.3 Factors Affecting The Aging Process

From Siti Bandiyah (2009) in Abdul Muhith (2016), the aging process may occur naturally (physiological) or due to disease (pathological), which develops over time. Some factors that affect aging include genetics, nutrition or food, health status, life experience, environment, and stress (Muhith & Siyoto, 2016).

1. Heredity or genetics

   DNA plays an important role in regulating cell function, and genetic mutations can contribute to cell death. Genetically, women tend to live longer than men because they have two X chromosomes, which carry important elements for life.

2. Nutrition or food

   Nutritional imbalances, both deficiencies and excesses, can weaken the immune system and accelerate the aging process.

3. Health status

   Diseases that are often associated with aging are generally more often caused by exposure to harmful external factors that last a long time, not aging itself.

4. Life experiences

   - Sun Exposure : Skin that is frequently exposed to the sun is prone to damage, including spots, wrinkles, and dullness.
   - Lack of Exercise : Exercise helps strengthen muscles and improve blood circulation, thus supporting the regeneration process.

- Alcohol Consumption : Alcohol can enlarge small blood vessels in the skin, increasing blood flow near the surface, which has a negative impact on skin health.
- Environment : Although biological aging is inevitable, maintaining health through a healthy lifestyle is very important.

5. Stress

Daily stress, whether at home, at work, or from lifestyle, can accelerate the aging process because it affects a person's physical and emotional balance.

2.3.4 Changes That Occur In The Elderly

The degenerative aging process occurs as age increases and affects various aspects of life, including physical, cognitive, emotional, social, and sexual (Azizah, 2011). The following is an explanation of the physical changes experienced :

2.3.4.1 Physical Changes

1. **Sensory System**

Hearing impairment, including presbycusis, is one of the changes that often occurs. This condition is marked by a decrease in the ability to hear, especially high frequencies, unclear sounds, and difficulty understanding words. This condition is generally experienced by individuals over 60 years old.

2. Integumentary System

For the elderly, the skin becomes thin, dry, wrinkled, and loses elasticity. The skin tends to experience atrophy, appearing saggy and less

hydrated. Atrophy of the sebaceous glands and sweat glands results in brown spots or liver spots.

3. Musculoskeletal System

As age increases, the musculoskeletal system undergoes various changes that include connective tissue, cartilage, bones, muscles, and joints. Collagen, which is the main component of skin, tendons, bones, and connective tissue, becomes less organized, losing its strength. In the joints, soft cartilage becomes softer and experiences damage, making its surface flatter. As a result, cartilage regeneration slows down, and degeneration occurs more rapidly, increasing the risk of friction between joints.

Aging also causes osteoporosis, which is a decrease in bone density that can trigger pain, bone deformities, and fractures. In muscles, there is a decrease in size and number of muscle fibers, while fat tissue and connective tissue increase. In addition, the elasticity of the connective tissue around the joints, including tendons, ligaments, and fascia, decreases, thus reducing flexibility and worsening stiffness in elderly joints.

4. Cardiovascular System

Changes including the accumulation of lipofuscin, classification of the SA node, and changes in conduction tissue to connective tissue cause the heart to be less flexible. The left ventricle experiences hypertrophy, reducing the heart's ability to stretch well.

5. Respiratory System

Changes in the lung connective tissue reduce airflow even though the total lung capacity remains the same. The reserve volume of the lungs increases to compensate for oxygen needs, but changes in muscles, cartilage, and thoracic joints make breathing more difficult.

6. Digestion and Metabolism

   Digestive function decreases, marked by :

   - Decreased production of digestive enzymes.
   - Loss of teeth and decreased sense of taste.
   - Decreased appetite due to reduced sensitivity to hunger.
   - Shrinkage of liver size and decreased blood flow to the digestive organs.

7. Urinary System

   Kidney function, including filtration, excretion, and reabsorption, experiences a decline. This affects the effectiveness of the urinary system in the elderly.

8. Nervous System

   In the elderly, the nervous system experiences progressive atrophy, resulting in a decrease in coordination ability and difficulty in carrying out daily activities.

9. Reproductive System

   For women, the ovaries and uterus shrink, and the breasts undergo atrophy. Meanwhile, in men, although sperm production gradually decreases, reproductive ability remains until old age (Muhith & Siyoto, 2016).

2.3.4.2 Cognitive Changes

As age increases, cognitive changes can be seen in various aspects, including performance, motivation, wisdom, intelligence level (IQ), learning ability, understanding, problem-solving, decision-making, and memory (Aspiani et al., 2014).

2.3.4.3 Mental Changes

Physical changes often affect mental changes, especially those related to the senses, general health, education level, hereditary factors, environment, and sensory nerve disorders including blindness and deafness. In addition, disturbances in self-concept, such as the loss of position or social role, loss of physical strength, relationships with friends and family, and changes in self-perception can affect the mental well-being of the elderly (Aspiani et al., 2014).

2.3.4.4 Spiritual Change

For many elderly individuals, religion or belief becomes an increasingly important part of their lives. The elderly tend to be more regular in carrying out daily religious activities and feel more prepared to face the reality that death is a part of life (Azizah, 2011).

2.3.4.5 Psychosocial Changes

Retirement, changes in personality, and changes in social roles in society are psychosocial challenges that are commonly faced by the elderly. Retirement marks a phase of life in which a person experiences major changes in their social roles, which often cause psychological stress. Retired elderly people often feel lost because they no longer have social interactions at work. In addition, they also face

many losses, including reduced income, loss of social status, friends, and activities that previously filled their days (Azizah, 2011).

As age increases, the elderly experience a decline in cognitive and psychomotor functions. Cognitive function, which includes learning processes, understanding, perception, and attention, makes their reactions and behaviors slower. Meanwhile, psychomotor function relates to the urge to move or act, which causes the elderly to become less responsive. The decline of these two functions contributes to changes in the personality of the elderly (Azizah, 2011).

Disruptions in function or disabilities experienced by the elderly can change their social roles in society, which often makes them feel alienated. In response, the elderly may exhibit regressive behavior (Stanley & Beare, 2007).

2.3.4.6 Decline In Sexual Function And Potential

Often, physical disorders in the elderly correlate with a decline in their sexual function and potential. In addition, psychological factors such as feelings of shame or feeling unworthy of maintaining a sexual life in old age also influence this. Furthermore, traditions, culture, and the views of family and society that are less supportive exacerbate the situation (Azizah, 2011).

2.3.4.7 Changes In Sleep And Rest Patterns

Aging affects the nervous system, causing changes in excitation and inhibition. As we age, some parts of the brain, especially the cortex, function to decrease the level of alertness. The following inhibitory functions also decrease over time. The frontal cortex also plays a role in controlling sleep patterns. Decreased blood flow, changes in neurotransmitters, and changes in synapses are

important factors in the differences in sleep and wakefulness patterns associated with aging. In addition, external factors such as retirement can also affect the need for activity, energy, and sleep. Social and psychological circumstances such as loss can increase the risk of depression in older adults, which has an impact on their sleep patterns. Not only aging, the environment also plays a role in influencing a person's sleep patterns (Maas, 2011).

2.3.5 Health Problems In The Elderly

As age increases, the body becomes more vulnerable to various health problems due to the decline in the function of body organs. Many common health issues are encountered in the elderly, among them mentioned in the book Elderly by Kusumo (Kusumo, 2021), including :

1. Hypertension (High Blood Pressure)

   High blood pressure occurs when systolic blood pressure is more than 140 mmHg or diastolic exceeds 90 mmHg.

2. Diabetes Mellitus

   Diabetes mellitus, or diabetes, is characterized by elevated blood sugar levels exceeding 200 mg/dl due to damage to the beta cells of the pancreas, which function to produce insulin.

3. Joint Disease (Arthritis)

   Arthritis is an autoimmune disease that damages joints and causes disability, requiring long-term care and monitoring.

4. Stroke

A stroke occurs when a blood vessel in the brain bursts or is blocked, disrupting the supply of oxygen and nutrients to the brain.

5. Chronic Obstructive Pulmonary Disease (COPD)

   COPD is a chronic lung disease that causes airflow obstruction in the airways, worsening over time, and cannot return to normal.

6. Depression

   Depression is a condition of feeling sad and depressed that lasts more than two weeks and does not go away.

2.4 Difference In Blood Pressure Before And After Implementing DASH Diet In Elderly People With Hypertension

Research titled "The Application of the DASH Diet Pattern on Blood Pressure in Hypertensive Patients in Kalikangkung Village, Semarang" by Fitriyana and Karunianingtyas (2022) indicates that following the DASH diet can stabilize blood pressure. This matter proves that this diet helps hypertensive patients reduce their blood pressure and manage their eating patterns better, allowing them to prevent complications due to unhealthy eating (Fitriyana & Karunianingtyas, 2022).

Research titled “Intervention Of The DASH (Dietary Approach To Stop Hypertension) Diet On Blood Pressure Reduction In The Elderly At BSLU Mandalika” by Wahyuningsih and colleagues in 2024, with subjects aged 70-74 years (33.3%) in the treatment group and 75-80 years (50%) in the control group, indicates that the average blood pressure in both groups before the intervention was higher compared to after. The findings of the statistical test where the paired t-test indicated a significant difference for systolic blood pressure (p=0.000) and diastolic

(p=0.000) before and after the intervention. Meanwhile, the test for differences between the two groups indicated that before the intervention there was no significant difference, but after the intervention there were changes in systolic and diastolic blood pressure. From these results, it can be concluded that the application of the DASH diet has a significant effect in lowering systolic blood pressure (p=0.000) and diastolic (p=0.034) for the elderly after the diet was given (Wahyuningsih et al., 2024).

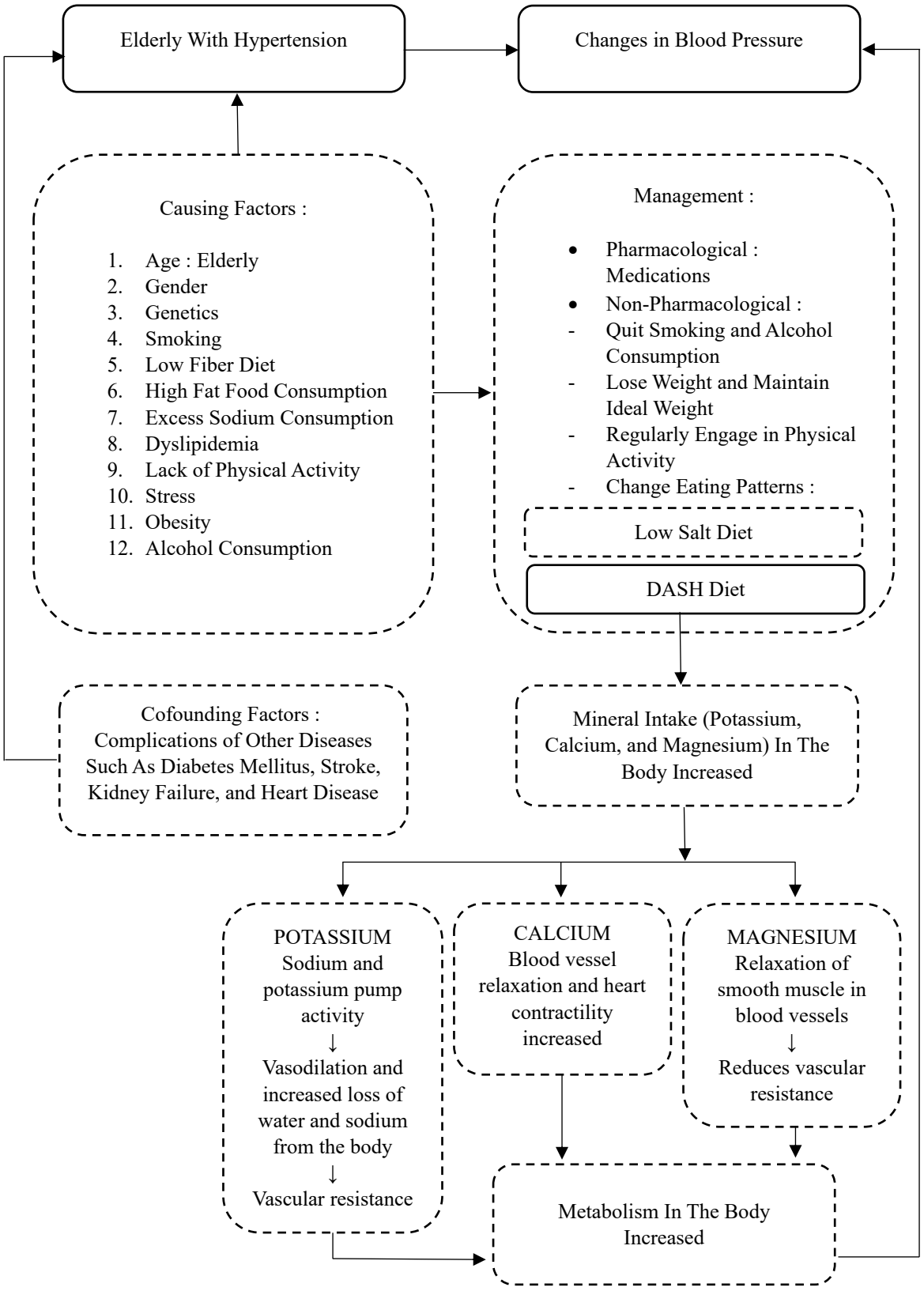
Research titled "Implementation of DASH Diet Recommendations Compared to Low Salt Diet Based on Nutritional Counseling on Reducing Blood Pressure in Hypertensive Patients at the North Larangan Health Center" by Astuti and colleagues (2021) indicates that with nutritional counseling, the DASH diet is associated with a decrease in systolic and diastolic blood pressure, as well as a decrease in sodium intake in hypertensive patients which is more significant than with a low salt diet. However, after considering many variables, including initial diastolic blood pressure and Body Mass Index (BMI), it was found that the following factors influenced the amount of decrease in diastolic blood pressure in respondents (Astuti et al., 2021).

Research titled “Implementation of Dietary Approaches To Stop Hypertension (DASH) on Blood Pressure Reduction in Hypertensive Patients at Karang Anyar Health Center” by Nortajulu and colleagues (2023) indicates that the implementation of the DASH diet, which includes eating three times a day for three days, successfully lowered the blood pressure of hypertensive patients. This matter

indicates that the DASH diet is effective in helping to lower blood pressure in patients with hypertension (Nortajulu et al., 2023).

Research titled “DASH Diet Management as an Intervention in Hypertensive Elderly: A Systematic Review” by Febriana and Heryyanoor (2023) concludes that based on five analyzed articles, the DASH diet management intervention is proven effective for the elderly suffering from hypertension. Several articles found reveal that this intervention not only teaches the elderly about appropriate foods and portions but also builds awareness so that they can implement this diet in their daily lives to prevent high blood pressure (Febriana & Heryyanoor, 2023).

2.5 Conceptual Framework



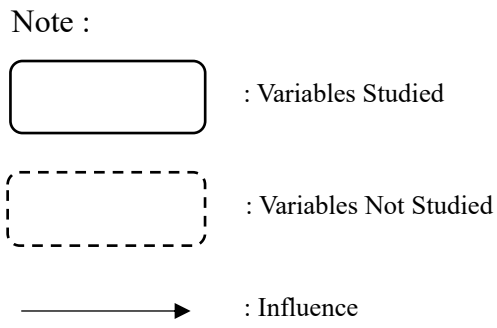


Figure 1 Conceptual Framework Of The Difference In Blood Pressure Before And After Implementing Dietary Approaches To Stop Hypertension (DASH) Diet In Elderly People With Hypertension In RT 03 RW 01 Sekarpuro Village Pakis District Malang Regency

2.6 Research Hypothesis

The research hypothesis is a temporary answer to the problem being studied, which needs to be tested for its truth through empirical testing (Sugiyono, 2015). The hypothesis in this research is as below :

1. H0 : There is no significant difference in blood pressure in elderly hypertensive before and after the implementation of the DASH diet in RT 03 RW 01 Sekarpuro Village Pakis District Malang Regency.
2. H1 : There is a significant difference in blood pressure in elderly hypertensive before and after the implementation of the DASH diet in RT 03 RW 01 Sekarpuro Village Pakis District Malang Regency.