

# The Relationship of Physical Activity and Diet to the Incidence of Hypertension in the Elderly

*by* Frisca Ronauli Batubara

---

**Submission date:** 17-Oct-2022 02:46PM (UTC+0700)

**Submission ID:** 1927502100

**File name:** ity\_and\_Diet\_to\_the\_Incidence\_of\_Hypertension\_in\_the\_Elderly.pdf (247.82K)

**Word count:** 9007

**Character count:** 48163

# The Relationship of Physical Activity and Diet to the Incidence of Hypertension in the Elderly

Frisca Ronauli Batubara<sup>1</sup>, Frits Reinier Wantian Suling<sup>2</sup>

<sup>1,2</sup>Medical Faculty, Universitas Kristen Indonesia, Jakarta, Indonesia

Corresponding Author: Frisca Ronauli Batubara

DOI: <https://doi.org/10.52403/ijshr.20221011>

## ABSTRACT

Hypertension is a blood pressure condition 140/90 mmHg, and hypertension is the number one non-communicable disease worldwide that can cause death. The prevalence of hypertension increases with age. This study aims to determine whether there is a relationship between physical activity and diet on the incidence of hypertension in the elderly in RW 011, Cawang Village, East Jakarta. This study is a quantitative study with a cross-sectional study design with physical activity and diet as independent variables and the incidence of hypertension as the dependent variable. The sample of this study was elderly in RW 011, Cawang Urban Village, East Jakarta, totaling 65 people with a simple random sampling method. Blood pressure data were obtained by measuring blood pressure using a sphygmomanometer. Physical activity using the IPAQ (International Physical Activity Questionnaire) questionnaire and eating patterns using the FFQ (Food Frequency Questionnaire) questionnaire. Data analysis was performed using the Chi-Square test. This study showed that most of the incidence of hypertension had a percentage of 78.5%. Light physical activity was 40 respondents (65.5%), the diet with the most sodium intake was 38 respondents (58.5%), and the most fat intake was 36 respondents (55.4%), and the information on potassium was rarely or not as much as 36 (55.4%) respondents. The analysis results of the relationship between physical activity and the incidence of hypertension ( $p = 0.001$ ). The results of the analysis of the relationship between dietary intake of sodium intake with the incidence of

hypertension ( $p = 0.000$ ) and fat intake with the incidence of hypertension ( $p = 0.023$ ), and potassium intake with hypertension ( $p = 0.004$ ). The conclusion is that there is a significant relationship between physical activity and diet with the incidence of hypertension in the elderly in RW 011, Cawang Village, East Jakarta City.

**Keywords:** Hypertension, Elderly, Physical Activity, Diet

## INTRODUCTION

An elderly is someone who reaches the age of 60 years and over, based on Government Regulation of the Republic of Indonesia Number 43 of 2004. The older the period, the more significant the proportion of the elderly who experience health complaints. In the elderly, there will be a decrease in the function of the body's organs; therefore, the elderly is easily exposed to various diseases, one of which is the emergence of high blood pressure, often referred to as hypertension. Hypertension is the world's number one cause of death [1].

Hypertension is when a person experiences an increase in blood pressure either slowly or suddenly. According to the International Society of Hypertension (ISH) and The Seventh Report of The Joint National Committee on Prevention, Detection, Evaluation, and Management of High Blood Pressure (JNC VIII), a person is said to be hypertensive if a person's systolic blood pressure is more than 140 mmHg and diastolic blood pressure is more than 140

mmHg than 90 mm Hg. The ideal blood pressure value is 120/80 mmHg [1]. This disease is categorized as silent because the patient does not know he has hypertension before checking his blood pressure. Hypertension that occurs in the long term and continuously will become a severe problem because if it is not treated as early as possible, it can trigger dangerous complications such as heart disease, congestive heart failure, stroke, diabetes, visual impairment, and is a significant cause of chronic kidney failure [2].

Data from the World Health Organization (WHO) in 2015 showed that around 1.13 billion people had hypertension, meaning that 1 in 3 people worldwide was diagnosed with hypertension [3]. The number of people with hypertension continues to increase every year, and it is estimated that by 2025 there will be 1.5 billion people affected by hypertension; it is estimated that 9.4 million people die from hypertension and its complications yearly. Based on the Basic Health Research (Riskesdas) in 2018, the prevalence of hypertension based on measurements in the population aged >18 years was 34.1%, the highest was in South Kalimantan (44.1%), while the lowest was in Papua (22.2%) [4]. Hypertension occurs in the age group 31-44 years (31.6%), age 45-54 years (45.3%), age 55-64 years (55.2%) [5]. From the data provided by the Ministry of Health (Kemenkes) in 2018, hypertension became the first rank of non-communicable diseases diagnosed in health facilities, with the number of cases reaching 185,857. Riskesdas 2018 shows the prevalence of hypertension has increased compared to Riskesdas 2013, which has increased from 25.8% to 34.1% [6]. Hypertension is Indonesia's fourth largest cause of death, and the hypertension death rate in 2016 was 5.8% of all deaths [7].

Found several risk factors that can cause hypertension. Risk factors for hypertension are divided into two groups, namely factors that cannot be changed, such as heredity, gender, and age, and factors that can be changed, such as diet, lack of exercise or

activity, smoking, drinking coffee, alcoholism, stress, work, and education. The diagnosis of hypertension will be established if the risk factors coincide, or in other words, if more than one risk factor is found, it can be said to be hypertension. Hypertension can be prevented by avoiding the risk factors that cause hypertension by adjusting the diet and lifestyle, avoiding coffee, smoking, and alcohol, reducing excessive salt consumption and doing adequate activities such as regular exercise.

Based on the data above, the authors want to study the relationship between diet and physical activity on the incidence of hypertension in the elderly in RW 011, Cawang Village, East Jakarta. The problems of this research are: Is there a relationship between physical activity and diet on the incidence of hypertension in the elderly in RW 011, Cawang Village, East Jakarta City?

## LITERATURE REVIEW

Blood pressure is the force exerted by blood against the blood vessels' walls and is caused by the blood pressure against the walls of arteries when the blood is pumped throughout the body. The pressure applied can vary depending on the blood vessels and heart rate. The higher the pressure, the more complex the heart has to pump. Blood pressure is most elevated when the ventricles contract or when the heart beats (systolic pressure) and lowest when the ventricles relax or when the heart muscle relaxes (diastolic pressure) [5; 6].

Blood pressure is measured in millimeters of mercury (mmHg). According to the International Society of Hypertension (ISH) and The Seventh Report of The Joint National Committee on Prevention, Detection, Evaluation, and Management of High Blood Pressure (JNC VIII), hypertension is diagnosed when systolic blood pressure reaches 140 mmHg or more and diastolic blood pressure reaches 90 mmHg or more [1; 13]. Normal systolic and diastolic blood pressure is essential for vital organs such as the heart, brain, and kidneys

to function efficiently. The ideal blood pressure value is 120/80 mmHg, but if someone has a blood pressure of 105/60 mmHg, that person's blood pressure is still within normal limits [7; 8]. Hypertension is often found in the elderly. Along with increasing age, the higher a person gets risk of hypertension. It is often caused by natural changes in the body that affect the heart, blood vessels, and hormones [1; 9].

Until now, hypertension is still a top priority for health problems and is a major risk factor for non-communicable diseases in Indonesia. Based on data from the World Health Organization (WHO), this disease affects 22% of the world's population. While in Southeast Asia, the incidence of hypertension reaches 36% [3]. Based on the Basic Health Research (Riskesmas) in 2018, the prevalence of hypertension based on measurements in the population aged >18 years was 34.1%. This figure increased quite high compared to the results of Riskesdas in 2013, which was 25.8% [4]. The highest prevalence is in South Kalimantan (44.1%), while the lowest is in Papua (22.2%). In 2018 hypertension occurred in the 18-24 year age group (13.2%), 25-34 years old (20.1%), 35-44 years old (31.6%), 45-54 years old (45.3%), age 55-64 years (55.2%), age 65-74 years (63.2%), age 75 years and over (69.5%). Compared to Riskesdas data in 2013, hypertension that occurred in the age group 15-24 (8.7%), age 25-34 years (14.7%), age 35-44 years (24.8%), age 45-54 years (35.6%), age 55-64 years (45.9%), age 65-74 years (57.6%), age more than 75 years (63.8%). It shows that hypertension increased significantly in 2018 [9].

Almost all significant guidelines, both from within and outside the country, state that a person is said to be hypertensive if they have a systolic blood pressure of 140 mmHg or more and a diastolic blood pressure of 90 mmHg or more [10]. Blood pressure measurements are carried out at least two times within one week to establish the diagnosis of hypertension. According to The Seventh Report of The Joint National

Committee on Prevention, Detection, Evaluation, and Management of High Blood Pressure (JNC VIII), previously considered blood pressure values increase cardiovascular complications.

So in the latest classification, there is pre-hypertension for systolic blood pressure values of 120-139 mmHg and diastolic blood pressure of 80-90 mmHg [11]. Pre-hypertension is not a disease condition but describes the condition of a person at risk of developing hypertension in the future. The purpose of the JNC VIII classification is to identify individuals to help lower their blood pressure to an average level with initial treatment in the form of lifestyle changes.

While the classification of hypertension according to the American College of Cardiology (ACC) and the American Heart Association (AHA). Although the definition of normal BP remains the same as in JNC VII, the 2017 guidelines replaced the term "pre-hypertension" with "elevated blood pressure" [12]. The classification of blood pressure in Indonesia based on the consensus produced by the First National Scientific Meeting of the Indonesian Hypertension Association has not yet established a hypertension category for Indonesians. Research data on hypertension in Indonesia on a national scale is so rare that the Indonesian Nephrology Association (Pernefri) chose a classification that follows the category of the World Health Organization (WHO)/International Society of Hypertension (ISH) because it has a wide distribution [6].

Table 1. Classification According to WHO/ISH

Blood Pressure Classification	SBP (mmHg)	DBP (mmHg)
Optimal	< 120	< 80
Normal	120 – 129	80 – 84
High normal	130 – 139	85 – 89
Grade 1 hypertension (mild)	140 – 159	90 – 99
Grade 2 hypertension (moderate)	160 – 179	100 – 109
Grade 3 hypertension (severe)	≥ 180	≥ 110
Isolated systolic hypertension	≥ 140	< 90

SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure

Based on the cause, hypertension is divided into two groups, namely essential hypertension/primary hypertension and secondary hypertension/renal hypertension [13]. While the risk factors for hypertension are divided into two categories, namely risk factors that cannot be changed (genetic, age, and gender) and risk factors that can be changed (lack of physical activity, obesity, stress, salt consumption, fat consumption, smoking, consumption of alcohol and caffeine).

The body has a system that functions to prevent acute changes in blood pressure caused by circulatory disorders, which tries to maintain blood pressure stability in the long-term cardiovascular reflexes through the nervous system, including the control system that reacts immediately. Long-term blood pressure stability is supported by a system that regulates the number of body fluids that involves various organs, especially the kidneys [6]. The pathophysiology of hypertension occurs through multiple mechanisms, namely changes in the anatomy and physiology of blood vessels, cardiac output and peripheral resistance, the renin-angiotensin system, and the sympathetic nervous system [14].

At all ages, the diagnosis of hypertension cannot be made in one measurement. It can only be established after two or more measures at rest at different visits unless there is an increase in height or accompanying clinical symptoms more common due to several factors such as cuff length, which may not be sufficient for obese people or excessive in thin people. Decreased baroreceptor reflex sensitivity often causes fluctuations in blood pressure and postural hypotension. Changes due to tension, white coat hypertension & physical exercise are also more common in the elderly. Stiff arteries due to atherosclerosis cause measurably higher blood pressure [15].

Blood pressure measurements were performed while the patient was sitting after resting for 5 minutes. The instrument used to measure blood pressure is called a

sphygmomanometer. There are several types of sphygmomanometers, but the most common consists of a rubber cuff wrapped in a material fixed around it evenly without causing constriction [6]. The history carried out includes the level of hypertension and the duration of it, previous antihypertensive treatment, history, and symptoms of related diseases such as coronary heart disease, cerebrovascular disease, and others. Is there a history of illness in the family, symptoms related to hypertension, signs of organ damage, changes in activity or habits as risk factors for hypertension (such as smoking, food consumption, history and personal, family, environmental, work, and others factors) [5]. Supportive examinations that can be performed include routine laboratory examinations carried out before starting therapy to determine the presence of organ damage and other risk factors or find the cause of hypertension. Urinalysis, complete peripheral blood, blood chemistry (potassium, sodium, creatinine, fasting blood sugar, total cholesterol), and ECG examinations are performed.

The elderly is the last period or stage in individual development. Not all individuals can pass this stage. The aging process is a natural process faced by humans, but not all individuals can give or reach this stage, so the elderly period is also referred to as the golden period in human life. The elderly is someone who has entered the age of 60 years and over. Specific physical and psychological changes characterize old age. These effects determine the elderly in making good or bad adjustments, but the characteristics of old age tend to lead to and lead to insufficient adjustments rather than good and misery than happiness, which is why old age is more vulnerable than young age.

Health in the elderly is influenced by the aging process experienced physiologically by each individual, where in this process, there is a decrease in body function and physical changes. Decreased function and physical changes occur systemically, and most of the body's systems are affected by

aging. Cardiovascular system, excretory system, digestive system, immune system, and other systems [16]. WHO limits the middle age (middle age) between 45-59 years, elderly (elderly) between 60-74 years, old age (old) between 75-90 years, and ancient age above 90 years. Meanwhile, the Republic of Indonesia Health Ministry stated that the elderly was a group that entered the age of 60 years and over [17].

According to Prof. Dr. Koesmanto Setyonegoro, the elderly is grouped into young adults (elderly adulthood), 18 or 20-25 years, middle years or maturity, 25-60 years or 65 years, old age more than 65 years or 70 years divided by 70 – 75 years (young-old), 75 – 80 years (old), more than 80 (very old) [18]. According to Law no. 4 of 1965 Article 1, a person can be declared as an older person or elderly after the person reaches 55 years, does not have or is powerless to earn his living for his daily needs, and receives a living from other people. Law No. 13 of 1998 concerning the welfare of the elderly is someone who reaches the age of 60 years and over.

Physical activity is a collection of body movements produced by skeletal muscles using energy or energy expenditure [19]. Physical activity usually includes activities needed for work, household activities, transportation, recreation, and sports activities. Physical activity must be distinguished from sports. Sport or physical exercise is a subcategory of physical activity. Sport is a planned and structured physical activity involving repeated body movements to improve physical fitness. Physical activity can be classified into three categories: mild and moderate, and severe [20]. Factors that affect physical activity are age, gender, diet, disease or abnormalities in the body, emotions, work, and sleep quality.

Older people should do some physical activity. The physical activities are a) a Minimum duration of 150 minutes for moderate physical exercise or 17 minutes for heavy physical exercise within one week; b) For each exercise, the duration of the activity lasts at least 10 minutes. If you

are used to the recommended duration, then the duration of exercise for the elderly is at moderate intensity for 30 minutes at heavy intensity for 150 minutes in one week; and c) Most of the elderly have problems in body coordination, so they need balance training sessions at least three times a week, while for muscle training at least two times a week.

Physical activity that is beneficial for the health of the elderly should meet the FITT criteria (frequency, intensity, time, type). Frequency means how often the activity is done and how many days a week. Intensity is how strenuous the activity is and can be divided into light, medium and heavy intensity. Time refers to how long an activity is carried out in one meeting. The types of physical activity for the elderly include aerobic exercise, muscle strengthening, flexibility, and balance training. How much activity is done depends on the goals of each individual [21].

Regular physical activity can help improve the overall work of the heart. Physically active people generally have lower blood pressure and are less likely to develop high blood pressure. They have better muscle and joint function and make the body's organs more substantial and flexible, and activities in the form of aerobic exercise help improve and maintain cardio-respiratory fitness and endurance. Examples of aerobic exercise include walking, jogging, swimming, and cycling. Aerobic exercise makes the muscles of the bodywork. Physical activity that is carried out regularly causes changes in the organs contained in the body. For example, the smooth muscle in the heart will get more robust so that the capacity is large, and the pulse becomes more robust and more regular. Besides that, the elasticity of blood vessels will increase due to relaxation and relaxation. Vasodilation so that fat deposits will decrease and increase muscle contraction in the walls of these blood vessels. It can be concluded that the lack of physical activity makes organs and blood and oxygen supply stagnate, thereby

increasing blood pressure. Regular physical activity can lower or stabilize blood pressure [22].

Diet is a way or effort to regulate the amount and type of food eaten every day by a person and is a characteristic of particular community groups to maintain health, and nutritional status, preventing or helping cure a disease. Diet includes various things such as attitudes, beliefs, and food choices. People's attitudes towards food can be both positive and negative. Positive or negative attitudes towards food are rooted in affective values, which come from the environment where a person grows and develops. Likewise, the belief in food is related to cognitive values. Namely, food quality is good or bad, attractive or unattractive. Selection is a psychomotor process of choosing food according to attitudes, behavior, and beliefs [23]. The pattern of eating that is formed is closely related to a person's eating habits. The diet has three components: the type of food, frequency, and amount of food. Factors that influence diet are economic, socio-cultural, religious, educational, and environmental [24].

The eating patterns of the elderly that are applied are closely related to the eating habits of the elderly. Eating habits determine the intake of nutrients that will enter the body and improve the quality of the nutritional status of the elderly. The balance between the amount of food eaten and the body's needs will impact a person's nutritional status and is classified as good. The arrangement of dishes or daily food menus consisting of various kinds of food ingredients and quality in the right quantities and proportions can be used as a person to maintain his health and fitness so that a good diet and eating habits are needed to meet the body's nutritional needs [24].

An irregular and balanced diet are one of the risk factors that increase the incidence of hypertension. The composition of foods high in calories, fat, carbohydrates, too much protein, and low in fiber can cause an imbalance in nutritional consumption and is

a risk factor for hypertension. The number of calories that enter will affect fat tissue in the body, which means that more or less calorie intake will increase or decrease fat tissue in the body. Foods that contain high salt will cause an increase in blood pressure because sodium (Na) binds to a lot of water, so the blood volume in the body increases. Consumption of high fat can cause blood pressure to increase. Excessive fat consumption will increase cholesterol levels in the blood, especially LDL cholesterol, and accumulate in the body. Fat deposits caused by cholesterol will stick to blood vessels, eventually forming plaque. Lack of consumption of foods containing potassium (K) or fiber causes the amount of Na to accumulate, increasing the pressure on the heart rate. Consumption of vegetables and fruits that provide nutrients such as potassium, limiting sodium intake, foods high in sugar and reducing consumption of total fat and saturated fat, and avoiding alcohol and caffeine consumption can lower blood pressure. Therefore, it is recommended from an early age to limit the consumption of foods that can cause hypertension, especially for those who have a history of hypertension and those who are approaching old age [26].

## RESEARCH METHOD

This study uses a correlational research design through a cross-sectional approach, which is a type of research that emphasizes the measurement time or data observation of the independent variable and the dependent variable only once. The analysis was carried out in March 2021. This research was carried out in RW 011, Cawang Village, East Jakarta City. In this study, the population used was the elderly in RW 011, Cawang Urban Village, East Jakarta. The sample in this study was the elderly in RW 011, Cawang Urban Village, East Jakarta. The sample size in this study used the Slovin formula. Therefore, the research sample obtained using this formula was 65 samples. Sampling in this study uses the Simple Random Sampling technique so that

each member or unit of the population has the same opportunity to become the research sample. The method used is to draw a member of the population (lottery technique). The data obtained and collected by the respondents is then processed through editing, coding, data entry, tabulating, and cleaning procedures. The entire data processing process is carried out using a computer with two stages: Univariate analysis and bivariate analysis.

## RESULT AND DISCUSSION

This research was conducted in the Cawang Village area. This village is located in the administrative area of Kramat Jati District, East Jakarta. This village has a population of 39,126 people and an area of 179.04 ha. The boundaries of the Cawang Village area:  
 North side : Jalan MT Haryono  
 West side : Ciliwung River  
 East : Jalan Mayjend Soetoyo  
 South side : Hero's Cemetery Street  
 More specifically, this research was conducted on 65 older people in RW 011. And the population is 2,796 people.

Table 2. Distribution of Hypertension Incidence in the Elderly in RW 011, Cawang Village, East Jakarta

Hypertension Incidence	Frequency (n)	%
No Hypertension	14	21,5
Hypertension	51	78,5
Total	65	100

From the data on the frequency distribution of hypertension in the elderly, as listed in table 2, it was found that as many as 14 people (21.5%) "do not have hypertension" and 51 people (78.5%) "have hypertension."

Table 3. Distribution of the Frequency of Physical Activity in the Elderly in RW 011, Cawang Village, East Jakarta

Physical Activity	Frequency (n)	%
Light	40	65,5
Severe	18	27,7
Heavy	7	10,8
Total	65	100

Table 7. Relationship of Physical Activity with Hypertension Incidence in Elderly RW 011 Cawang Village

Physical Activity	Hypertension Incidence				Total		P Value
	No Hypertension		Hypertension		n	%	
	n	%	N	%			
Light	3	21,4%	37	72,5%	40	61,5%	0,001
Severe	9	64,3%	9	17,6%	18	27,7%	
Heavy	2	14,3%	5	9,8%	7	10,8%	
Total					65	100%	

In this study, it can be seen that most of the respondents who are included in the "light" physical activity group are 40 people (65.5%), while as many as 18 people (27.7%) have "moderate" physical activity, and as many as seven people (10.8%) had "heavy" physical activity.

Table 4. Frequency Distribution of Sodium Intake Patterns in the Elderly in RW 011 Cawang Village, East Jakarta

Sodium Intake	Frequency (n)	%
Often	38	58,5
Not often	27	41,5
Total	65	100

From the data shown in table 4, 38 people (58.5%) and those who "not often" consume sodium, as many as 19 people (41.5%).

Table 5. Distribution of Dietary Frequency Based on Fat Intake in the Elderly in RW 011, Cawang Village, East Jakarta

Fat Intake	Frequency (n)	%
often	36	55,4
Not often	29	44,6
Total	65	100

From the data shown in table 5, it was found that 36 people "often" consumed fat (55.4%), and 29 people "not often" consumed fat (44.6%).

Table 6. Distribution of Dietary Frequency Based on Potassium Intake in the Elderly in RW 011, Cawang Village, East Jakarta

Potassium Intake	Frequency (n)	%
Often	29	44,6
Not often	36	55,4
Total	65	100

From the data shown in table 6, it was found that the elderly who "frequently" consume potassium were 29 people (44.6%), and those who "not often" consume fat were 36 people (55.4%).



The analysis of the relationship between physical activity and the incidence of hypertension in the elderly in RW 011 showed that 40 respondents (61.5%) had "light" physical activity. Among the 40 respondents, 3 respondents (21.4%) "do not have hypertension" and 37 respondents (72.5%) have "hypertension". A total of 18 respondents (27.7%) had "moderate" physical activity, 9 respondents (64.3%) "did not have hypertension" and 9 respondents (17.6%) had "hypertension".

Meanwhile, seven respondents had "heavy physical activity, two respondents (14.3%) "did not have hypertension," and five respondents (9.8%) had "hypertension." Based on the Chi-Square test that has been carried out, the significance number obtained from the Chi-Square test is 0.001 ( $p < 0.05$ ); statistically, it shows a significant relationship between physical activity and the incidence of hypertension in the elderly in RW 011, Cawang Village.

**Table 8. Relationship of Sodium Intake with Hypertension Incidence**

Hypertension Incidence	Sodium Intake				Total		P Value
	Often		Not often		n	%	
	n	%	n	%			
No Hypertension	2	14.3%	12	85.7%	14	100%	0,000
Hypertension	36	70.6%	15	29.4%	51	100%	
Total	38	58.5%	27	41.5%	65	100%	

Based on table 8 above, 38 respondents (58.5%) "often" consume sodium. Among them, there are two respondents (14.3%) who "do not have hypertension" and 36 respondents (70.6%) who have "hypertension." Meanwhile, 27 respondents (41.5%), 12 respondents (85.7%) did not

have hypertension and 15 respondents (29.4%) experienced hypertension. The statistical test results obtained from the Chi-Square test were 0.000 ( $p < 0.05$ ), which showed a significant relationship between sodium intake and hypertension in the elderly in RW 011, Cawang Village.

**Table 9. Relationship between Fat Intake and Hypertension Incidence in Elderly RW 011 Cawang Village**

Hypertension Incidence	Fat Intake				Total		P Value
	Often		Not often		n	%	
	n	%	n	%			
No Hypertension	4	28.6%	10	71.4%	14	100%	0,023
Hypertension	32	62.7%	19	37.3%	51	100%	
Total	36	55.4%	29	44.6%	65	100%	

Based on table 9 above, 36 respondents (55.4%) "often" consume fat, 4 respondents (28.6%) "do not have hypertension" and 32 respondents (62.7%) have "hypertension". Meanwhile, 29 respondents (44.6%), 10 respondents (71.4%) did not have hypertension and 19 respondents (37.3%)

experienced hypertension. From the results of statistical tests, the significant number of the Chi-Square test was 0.023 ( $p < 0.05$ ), which showed a significant relationship between fat intake and the incidence of hypertension in the elderly in RW 011, Cawang Village.

**Table 10. Relationship of Potassium Intake with Hypertension Incidence**

Hypertension Incidence	Potassium Intake				Total		P Value
	Often		Not often		n	%	
	n	%	N	%			
No Hypertension	11	78.6%	3	21.4%	14	100%	0,004
Hypertension	18	35.3%	33	64.7%	51	100%	
Total	29	44.6%	36	55.4%	65	100%	

Based on table 10 above, the elderly who "frequently" consume potassium are 29 respondents (44.6%), 11 respondents (78.6%) "do not have hypertension" and 18

respondents (35.3%) have "hypertension". While those who "do not often consume potassium, as many as 36 respondents (55.4%), three respondents (21.4%) "do not

have hypertension," and 33 respondents (64.7%) have "hypertension." Based on the Chi-Square test, the significance number obtained from the Chi-Square test was 0.004 ( $p < 0.05$ ), which showed a significant relationship between potassium intake and the incidence of hypertension in the elderly in RW 011 Cawang Village.

The results showed that the prevalence of respondents who had hypertension was more than respondents who were not hypertensive. The highest systolic pressure obtained reached 210 mmHg, while the highest diastolic pressure reached 120 mmHg. According to The Seventh Report of The Joint National Committee on Prevention, Detection, Evaluation, and Management of High Blood Pressure, a person is declared hypertension if his systolic pressure is 140 mmHg or his diastolic pressure reaches 90 mmHg.

The incidence of hypertension experienced by the elderly in RW 011 Cawang Village in 2021 is quite high because more than half of the respondents suffer from hypertension (78.5%). It can be concluded that hypertension is a serious problem for the elderly in RW 011 Cawang Village and needs treatment and prevention to reduce the incidence of hypertension, namely by running a healthy lifestyle such as reducing sodium and fat intake, increasing potassium intake, doing physical activity and routinely control weight.

Hypertension can be a risk factor for disease for young adults and the elderly. However, the occurrence of complications is greater in the elderly. Hypertension will affect all organ systems and shorten life expectancy by 10-20 years if not treated. Lowering blood pressure can prevent organ damage related to the severity of hypertension, such as heart disease, kidney failure, stroke, eye disease, and blood vessels, and can prevent dementia and cognitive decline [27].

This study is in line with research conducted by Sauma et al., which states that several factors influence the incidence of hypertension in a person, especially in the elderly. Among them are consumption

patterns of sodium, fat, and potassium and physical activity [28]. The analysis results in this study indicate that the above factors are associated with hypertension. Based on the study's results, 40 respondents (65.5%) had light physical activity intensity, which showed that more than half of the respondents who did not do physical activity were at risk of developing hypertension. The highest units of MET - minutes/week reached 6426 MET - minutes/week, which included heavy physical activity, while the lowest was 259 MET - minutes/week. This study also found that some of the physical activities that almost all respondents often did were going up/down stairs, watching television, and walking leisurely in the morning/afternoon, so they were more at risk of developing hypertension.

Based on the study's results, 38 respondents (55.8%) frequently consumed sodium, so they were more at risk of developing hypertension. From the results of the FFQ (Food Frequency Questionnaire) questionnaire interview, it is known that the highest score of sodium consumption reaches 270, which includes frequent sodium consumption and the lowest score reaches 60, and the average score is 207.5. It is known that, on average, respondents still consume sodium or salt and MSG or flavoring, and respondents consume foods that trigger hypertension frequently, such as fresh fish processed by frying, fried foods, fried chicken eggs, and fried chicken eggs soy sauce. These foods, if consumed in the long term, will increase blood pressure.

Based on the results of the interviews, it was found that most of the respondents did not comply, and they lacked application according to consultation or counseling regarding hypertension and the dangers of high sodium foods given by health workers at the posyandu or puskesmas. Based on the study's results, it is known that respondents who often consume fat are 36 (55.4%), so the risk of hypertension is higher. From the results of the FFQ (Food Frequency Questionnaire) questionnaire interview, it was found that the average score of

respondents' fat consumption was 115. In addition, it was known that the highest score of fat consumption reached 190, and the lowest score reached 20.

Based on the results of the interview, it is known that most of the respondents who often consume fatty foods are due to food processing which is often processed by frying, and the habit of respondents using thick coconut milk and repeated cooking of food.

Based on the study's results, it is known that respondents who do not often consume potassium or fiber are 36 respondents (55.4%), so the risk of hypertension is higher. From the results of the FFQ (Food Frequency Questionnaire) questionnaire interview, it was found that the average score of respondents' potassium consumption was 115. In addition, it was known that the highest score of potassium consumption reached 150, and the lowest score reached 40.

Based on the results of the interview, it is known that most of the respondents do not often consume foods high in potassium because some of the respondents have complications of other diseases such as gout, so it is not recommended to consume green vegetables, and also some respondents rarely buy fruit because they do not like to eat vegetables or fruits.

Potassium is found in many raw or fresh foods. The process of cooking food can cause a loss of potassium in foodstuffs, and the addition of salt in the process of cooking food can cause the sodium content in the food to increase so that there can be changes in the balance of the ratio of sodium and potassium in the food [31].

Based on the study results, it is known that physical activity is divided into three categories, namely light, moderate and heavy physical activity. Table 6 shows that the incidence of hypertension in the elderly in RW 011 Cawang Village is more common in the elderly who have light physical activity (72.5%) compared to those who have moderate or heavy activity. Statistical tests showed a significant

relationship between physical activity and the incidence of hypertension, with a significance value of 0.001 ( $p < 0.05$ ).

This study is in line with research conducted by Wulandari et al. The bivariate analysis results showed a relationship between physical activity and the incidence of hypertension ( $p = 0.003$ ) [30]. The results of this study also follow Wildan's research which states that there is a relationship between physical activity and the incidence of hypertension ( $p = 0.000$ ). The higher the physical activity, the lower the blood pressure in patients with hypertension [31]. It is also in line with the research conducted by Susanti and Yuniarty regarding the relationship between the level of physical activity and the incidence of hypertension in the elderly at the Gamping I Public Health Center, Sleman, which showed a significant relationship between physical activity and the incidence of hypertension ( $p = 0.000$ ) [32].

The relationship between the level of physical activity and the incidence of hypertension occurs because physical activity can affect blood pressure stability. In people who are less physically active, their heart rate will be higher. As a result, when the heart muscle contracts, it works harder than usual. The harder the heart pumps blood, the greater the pressure placed on the artery walls, increasing peripheral resistance, which causes blood pressure to rise. Lack of physical activity can also increase the risk of being overweight, which will cause the risk of hypertension to increase [33]. Regular physical activity can train the heart muscle so that the heart can pump blood better without spending much energy. And the endorphins released during physical activity can also cause muscle relaxation, so that blood pressure does not increase. The lighter the work of the heart, the less pressure on the arteries so that blood pressure drops [34].

From the study results, it was found that respondents who consumed sodium more often experienced hypertension. As many as 38 respondents (70.6%) compared to

respondents who did not consume sodium frequently. Statistical tests showed a significant relationship between sodium intake and hypertension in the elderly in RW 011 Cawang Village, with a significance value of 0.000 ( $p < 0.05$ ). This study follows the statement of Mardanik (2017) that sodium intake has a strong relationship with an increase in blood pressure ( $p = 0.040$ ) with the incidence of hypertension ( $p = 0.000$ ) [35]. This is also in line with related research conducted by Mamoto et al. (2012), which showed a significant relationship between sodium intake and the incidence of hypertension ( $p = 0.003$ ) [36].

The effect of sodium intake on hypertension occurs through two mechanisms. First, high sodium intake will cause fluid body retention so that blood volume will increase. The second is that high sodium intake will cause the diameter of the arteries to narrow. High blood volume and narrowed artery diameter will force the heart to pump blood more forcefully to push the increased blood volume so that blood pressure increases [37]. Excess sodium intake will increase the extracellular fluid, and to normalize, the intracellular fluid is drawn out so that the extracellular fluid volume increases. The increased volume of extracellular fluid causes an increase in blood volume, thus leading to hypertension.

The study results show that respondents who often consume more fat suffer from hypertension, as many as 32 respondents (62.7%). Statistical test results obtained a significant value of 0.023 ( $p < 0.05$ ), indicating a significant relationship between fat intake and hypertension in the elderly in RW 011, Cawang Village.

The results of this study are in line with research conducted by Puspita, which states that there is a significant relationship between fat intake and the incidence of hypertension ( $p = 0.048$ ) [38]. It is also following research conducted by Hasiando which shows that the relationship between fat consumption habits and hypertension in the elderly ( $p = 0.001$ ) [39]. The results of

another study conducted by Utami showed the same thing there was a significant relationship between the frequency of fat consumption and hypertension ( $p = 0.002$ ) [40].

High fat intake can cause an increase in cholesterol, LDL, and triglyceride levels which will accumulate on the walls of blood vessels, and plaque will form. The plaque will be mixed with protein and covered by muscle cells and calcium, eventually developing atherosclerosis. Coronary blood vessels in patients with atherosclerosis will also experience constriction so that the resistance to blood flow in the coronary vessels increases. Blood vessels that are no longer elastic will cause an increase in systolic and diastolic blood pressure, which results in constriction of blood vessels called high blood pressure [41].

The results showed that the elderly in RW 011 Cawang Village who rarely or did not often consume more potassium suffered from hypertension, namely as many as 33 respondents (64.7%). Based on the Chi-Square test results, a significance value of 0.004 ( $p < 0.05$ ) was obtained, which means a significant relationship between potassium intake and hypertension.

This study is in line with Aelita's research that there is a significant relationship between potassium intake and hypertension ( $p = 0.019$ ). It is also stated that the incidence of hypertension is more experienced by respondents who rarely consume potassium than those who frequently consume sodium. According to research conducted by Sitorus, there was a significant relationship between potassium intake and the incidence of hypertension ( $p = 0.031$ ). Research conducted by Anggara also states the same thing, namely that there is a significant relationship between potassium intake and blood pressure with a significant value ( $p = 0.005$ ) [42].

The high incidence of hypertension experienced is closely related to changes in the ratio of sodium and potassium in the food consumed. Potassium is the main ion in the intracellular fluid. The way potassium

works are inversely proportional to sodium. Frequent consumption of potassium can increase the concentration in the intracellular fluid so that it tends to increase the intracellular fluid and lower blood pressure [43].

Potassium is very important in helping the kidneys function physiologically and is an electrolyte that acts as the body's electricity, along with sodium, chloride, and magnesium. In the elderly, there is a decrease in the ability to function of various organs and systems contained in the body, so potassium consumption is needed because it plays an important role in maintaining heart function, skeletal muscle, and smooth muscle contraction for digestive function and movement [44].

### CONCLUSION

Based on the results of research conducted on the elderly in the area of RW 011, Cawang Village, Kramatjati District, East Jakarta, the following conclusions can be drawn: a) 78.5% of the elderly have hypertension; b) 72.5% of the elderly only do light physical activity who are at risk of developing hypertension; and c) Based on diet 70.6% of the elderly often consume sodium, 62.7% of the elderly often consume fat, and 64.7% of the elderly rarely consume potassium. Therefore, it is expected to provide regular counseling to the elderly in RW 011, Cawang Village, East Jakarta, regarding hypertension and good physical activity for the elderly, as well as food ingredients at risk of causing hypertension. In addition, it is hoped that the community will carry out regular blood pressure checks at the Puskesmas or other health facilities to prevent and get faster treatment if hypertension occurs and can implement a healthy lifestyle by doing regular exercise for 30 minutes 2-3 times a week, and can maintain a good and balanced diet.

**Conflict of Interest:** None

**Source of Funding:** None

**Ethical Approval:** Approved

### REFERENCES

1. Handler J, Zhao Y, Egan BM. Impact of the number of blood pressure measurements on blood pressure classification in US adults: NHANES 1999–2008. *The Journal of Clinical Hypertension*. 2012 Nov;14(11):751-9.
2. Low Wang CC, Hess CN, Hiatt WR, Goldfine AB. Clinical update: cardiovascular disease in diabetes mellitus: atherosclerotic cardiovascular disease and heart failure in type 2 diabetes mellitus—mechanisms, management, and clinical considerations. *Circulation*. 2016 Jun 14;133(24):2459-502.
3. World Health Organization. Improving hypertension control in 3 million people: country experiences of programme development and implementation.
4. Arsyad DS, Westerink J, Cramer MJ, Ansar J, Visseren FL, Doevendans PA. Modifiable risk factors in adults with and without prior cardiovascular disease: findings from the Indonesian National Basic Health Research. *BMC Public Health*. 2022 Dec;22(1):1-1.
5. Maytasari S, Sartika RA. Family, Social, and Health Workers Support with Compliance Behaviour to Patients with Hypertension in Bogor, Indonesia. *Jurnal Promkes: The Indonesian Journal of Health Promotion and Health Education*. 2020 Sep 24;8(2):146-53.
6. Sari AG, Saftarina F. Family Medicine Services for Elderly Women with Uncontrolled Grade II Hypertension and Obesity. *Medical Profession Journal of Lampung*. 2021 Apr 19;11(1):54-62.
7. Hussain MA, Al Mamun A, Peters SA, Woodward M, Huxley RR. The burden of cardiovascular disease attributable to major modifiable risk factors in Indonesia. *Journal of epidemiology*. 2016 Oct 5;JE20150178.
8. LaPlume AA, McKetton L, Levine B, Troyer AK, Anderson ND. The adverse effect of modifiable dementia risk factors on cognition amplifies across the adult lifespan. *Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring*. 2022;14(1):e12337.
9. Febriyanti VN. The Benefits of Consuming Sardines to Prevent Hypertension and Type 2 Diabetes Mellitus for Senior Citizens. *Muhammadiyah International Public Health and Medicine Proceeding*. 2021 Nov 1;1(1):893-906.

10. Cushman, W.C., Ford, C.E., Cutler, J.A., Margolis, K.L., Davis, B.R., Grimm, R.H., Black, H.R., Hamilton, B.P., Holland, J., Nwachuku, C. and Papademetriou, V., 2002. Original Papers. Success and predictors of blood pressure control in diverse North American settings: the antihypertensive and lipid-lowering treatment to prevent heart attack trial (ALLHAT). *The Journal of Clinical Hypertension*, 4(6), pp.393-404.
11. Liszka HA, Mainous AG, King DE, Everett CJ, Egan BM. Prehypertension and cardiovascular morbidity. *The Annals of Family Medicine*. 2005 Jul 1;3(4):294-9.
12. Mirzaei M, Mirzaei M, Mirzaei M, Bagheri B. Changes in the prevalence of measures associated with hypertension among Iranian adults according to classification by ACC/AHA guideline 2017. *BMC cardiovascular disorders*. 2020 Dec;20(1):1-9.
13. Li N, Wang M, Cao M. Summary of secondary hypertension. In *Secondary Hypertension 2020* (pp. 3-21). Springer, Singapore.
14. Kalil GZ, Haynes WG. Sympathetic nervous system in obesity-related hypertension: mechanisms and clinical implications. *Hypertension Research*. 2012 Jan;35(1):4-16.
15. Boutouyrie P, Chowienczyk P, Humphrey JD, Mitchell GF. Arterial stiffness and cardiovascular risk in hypertension. *Circulation research*. 2021 Apr 2;128(7):864-86.
16. Saffrey MJ. Aging of the mammalian gastrointestinal tract: a complex organ system. *Age*. 2014 Jun;36(3):1019-32.
17. Lipoeto NI, Lin KG, Angeles-Agdeppa I. Food consumption patterns and nutrition transition in South-East Asia. *Public health nutrition*. 2013 Sep;16(9):1637-43.
18. Giovagnoli AR. Theory of mind across lifespan from ages 16 to 81 years. *Epilepsy & Behavior*. 2019 Nov 1;100:106349.
19. Westerterp KR. Physical activity and physical activity induced energy expenditure in humans: measurement, determinants, and effects. *Frontiers in physiology*. 2013 Apr 26;4:90.
20. Westerterp KR. Physical activity and physical activity induced energy expenditure in humans: measurement, determinants, and effects. *Frontiers in physiology*. 2013 Apr 26;4:90.
21. Butte NF, Ekelund U, Westerterp KR. Assessing physical activity using wearable monitors: measures of physical activity. *Med Sci Sports Exerc*. 2012 Jan 1;44(1 Suppl 1):S5-12.
22. Esteves M, Monteiro MP, Duarte JA. Role of regular physical exercise in tumor vasculature: favorable modulator of tumor milieu. *International Journal of Sports Medicine*. 2021 May;42(05):389-406.
23. Kulik NL, Moore EW, Centeio EE, Garn AC, Martin JJ, Shen B, Somers CL, McCaughy N. Knowledge, attitudes, self-efficacy, and healthy eating behavior among children: Results from the Building Healthy Communities trial. *Health Education & Behavior*. 2019 Aug;46(4):602-11.
24. Madjdian DS, Azupogo F, Osendarp SJ, Bras H, Brouwer ID. Socio-cultural and economic determinants and consequences of adolescent undernutrition and micronutrient deficiencies in LLMICs: a systematic narrative review. *Annals of the New York Academy of Sciences*. 2018 Mar;1416(1):117-39.
25. Macdiarmid JI, Kyle J, Horgan GW, Loe J, Fyfe C, Johnstone A, McNeill G. Sustainable diets for the future: can we contribute to reducing greenhouse gas emissions by eating a healthy diet?. *The American journal of clinical nutrition*. 2012 Sep 1;96(3):632-9.
26. Schwingshackl L, Hoffmann G. Diet quality as assessed by the Healthy Eating Index, the Alternate Healthy Eating Index, the Dietary Approaches to Stop Hypertension score, and health outcomes: a systematic review and meta-analysis of cohort studies. *Journal of the Academy of Nutrition and Dietetics*. 2015 May 1;115(5):780-800.
27. Sarnak MJ, Levey AS, Schoolwerth AC, Coresh J, Cullerton B, Hamm LL, McCullough PA, Kasiske BL, Kelepouris E, Klag MJ, Parfrey P. Kidney disease as a risk factor for development of cardiovascular disease: a statement from the American Heart Association Councils on Kidney in Cardiovascular Disease, High Blood Pressure Research, Clinical Cardiology, and Epidemiology and Prevention. *Circulation*. 2003 Oct 28;108(17):2154-69.
28. Sauma AW, Sriagustini I, Fitriani S, Hidayani WR, Malabanan LM. The

- Analysis of Factors Influencing Hypertension on Elderly: A Literature Study. *Journal of Public Health Sciences*. 2022 Aug 3;1(01):16-29.
29. Doyle ME, Glass KA. Sodium reduction and its effect on food safety, food quality, and human health. *Comprehensive reviews in food science and food safety*. 2010 Jan;9(1):44-56.
30. Wulandari I, Kusnanto K, Wibisono S, Andriani B, Wardani AR, Huri SA. Factors Affecting Blood Glucose Stability in Type 2 Diabetes Mellitus Patients. In 4th International Conference on Sustainable Innovation 2020–Health Science and Nursing (ICoSIHNS 2020) 2021 Jan 16 (pp. 420-424). Atlantis Press.
31. Börjesson M, Onerup A, Lundqvist S, Dahlöf B. Physical activity and exercise lower blood pressure in individuals with hypertension: narrative review of 27 RCTs. *British journal of sports medicine*. 2016 Mar 1;50(6):356-61.
32. Susanti NR, Yuniartika W. *Hubungan Aktivitas Fisik Dengan Kategori Hipertensi Pada Lansia Di Desa Purworejo Kabupaten Magetan* (Doctoral dissertation, Universitas Muhammadiyah Surakarta).
33. Chakravarthy MV, Joyner MJ, Booth FW. An obligation for primary care physicians to prescribe physical activity to sedentary patients to reduce the risk of chronic health conditions. In *Mayo clinic proceedings* 2002 Feb 1 (Vol. 77, No. 2, pp. 165-173). Elsevier.
34. Loreda JS, Nelesen R, Ancoli-Israel S, Dimsdale JE. Sleep quality and blood pressure dipping in normal adults. *Sleep*. 2004 Sep 1;27(6):1097-103.
35. Mardani T, Soviana E, Gz S. *Hubungan Asupan Natrium Dan Kalium Terhadap Tekanan Darah Pada Pegawai Negeri Sipil (PNS) Dinas Kesehatan Kota Surakarta* (Doctoral dissertation, Universitas Muhammadiyah Surakarta).
36. Nst ER, Siregar A, Lubis Z. *Hubungan Asupan Natrium dengan Kejadian Hipertensi di UPT Pelayanan Sosial Lanjut Usia Binjai Tahun 2014*.
37. Jacob M, Chappell D, Becker BF. Regulation of blood flow and volume exchange across the microcirculation. *Critical care*. 2016 Dec;20(1):1-3.
38. Puspita NA, Puspowati SD, Rustiningsih SK. *Hubungan Asupan Lemak, Asupan Natrium Dan Status Gizi Dengan Tekanan Darah Sistolik Pada Wanita Pralansia Di Pos Kesehatan Lansia Kelurahan Bojongsata Kecamatan Pemalang Kabupaten Pemalang* (Doctoral dissertation, Universitas Muhammadiyah Surakarta).
39. Hasiando CN, Amar MI, Fatmawati I. *Hubungan Kebiasaan Konsumsi Natrium, Lemak Dan Durasi Tidur Dengan Hipertensi Pada Lansia Di Puskesmas Cimanggis Kota Depok Tahun 2018*. *Jurnal Ilmiah Kesehatan Masyarakat: Media Komunikasi Komunitas Kesehatan Masyarakat*. 2019 Aug 7;11(2):214-8.
40. Utami WT. *Hubungan Pola Konsumsi Lemak Dan Kebiasaan Minum Kopi Dengan Hipertensi Pada Lansia Di Kelurahan Peguyangan Kecamatan Denpasar Utara* (Doctoral dissertation, JURUSAN GIZI).
41. Hendry C, Farley A, McLafferty E. Blood vessels, circulation and blood pressure. *Nursing Standard (through 2013)*. 2012 Nov 14;27(11):35.
42. Anggara FH, Prayitno N. Faktor-faktor yang berhubungan dengan tekanan darah di Puskesmas Telaga Murni, Cikarang Barat tahun 2012. *Jurnal ilmiah kesehatan*. 2013 Jan;5(1):20-5.
43. Stone MS, Martyn L, Weaver CM. Potassium intake, bioavailability, hypertension, and glucose control. *Nutrients*. 2016 Jul 22;8(7):444.
44. Zhuge Y, Zhang J, Qian F, Wen Z, Niu C, Xu K, Ji H, Rong X, Chu M, Jia C. Role of smooth muscle cells in Cardiovascular Disease. *International Journal of Biological Sciences*. 2020;16(14):2741.

How to cite this article: Frisca Ronauli Batubara, Frits Reinier Wantian Suling. The relationship of physical activity and diet to the incidence of hypertension in the elderly. *International Journal of Science & Healthcare Research*. 2022; 7(4): 79-92. DOI: <https://doi.org/10.52403/ijshr.20221011>

\*\*\*\*\*

# The Relationship of Physical Activity and Diet to the Incidence of Hypertension in the Elderly

## ORIGINALITY REPORT

11%

SIMILARITY INDEX

9%

INTERNET SOURCES

11%

PUBLICATIONS

8%

STUDENT PAPERS

## PRIMARY SOURCES

1	<a href="http://jddtonline.info">jddtonline.info</a> Internet Source	3%
2	<a href="http://ijshr.com">ijshr.com</a> Internet Source	2%
3	<a href="http://ijfmt.com">ijfmt.com</a> Internet Source	2%
4	Mega Martin. "Description of The Event Rate of Controlled and Uncontrolled Hypertension Patients at Malingping Public Health Center (Puskesmas)", Muhammadiyah International Public Health and Medicine Proceeding, 2021 Publication	2%
5	<a href="http://journals.viamedica.pl">journals.viamedica.pl</a> Internet Source	2%

Exclude quotes On

Exclude matches < 2%

Exclude bibliography On