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Determinants of Hypertension in Outpatients: A Cross-Sectional Study at Kramat Jati Health Center, East Jakarta

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This research aims to determine the factors that most cause the incidence of hypertension in outpatients at the Kramat Jati District Health Center, East Jakarta in 2024.
Study design: *Cross-Sectional Design*
Place and Duration of Study: This research was carried out at the Non-Communicable Diseases Polyclinic or Hypertension Polyclinic, Kramat Jati District Health Center, East Jakarta. Data collection took place for 2 weeks in February 2024.

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Methodology: The selected population is outpatients who have hypertension and are active as controls and non-hypertensive outpatients who visit the Kramat Jati District Health Center, East Jakarta. The selected samples were outpatients, specifically hypertensive patients at the Kramat Jati District Health Center, East Jakarta. Samples were collected using non-random accidental sampling technique and 101 research samples were obtained. Data Processing and Analysis using SPSS (Statistical Package for the Social Sciences) 29th version was used to view research results using univariate and bivariate analysis.
Results: The results obtained showed that 81 respondents (80.2%) experienced hypertension. The dominant characteristics of hypertensive patients were found to be women (65.3%), aged 56-65 years (28.7%), patients who had a family history of hypertension (52.5%), patients who consumed ≥ 5 grams of sodium (70 .3%), patients who did physical activity (76.2%), and patients who did smoke (31.7%). The factors of age (p-value = 0.0001), history of hypertension (p-value = 0.046), sodium diet (p-value = 0.0001), and smoking (p-value = 0.039) are significantly related and most dominantly influence the incidence. Hypertension. The factors of gender (p-value = 0.410) and physical activity (p-value = 0.454) were not significantly related to increasing blood pressure.
Conclusion: There is a significant relationship between factors that unmodified factors, namely age and family history of hypertension, with the incidence of hypertension at the Kramat Jati District Health Center, East Jakarta, and there is also a significant relationship between factors that can be changed, namely dietary sodium patterns and smoking activities, and the incidence of hypertension in Kramat Jati District Health Center, East Jakarta.

Keywords: Hypertension; risk factors; relationship; patients.

1. INTRODUCTION

High blood pressure is the result of measuring a person's blood pressure with a systolic value of 140 mmHg or more or a diastolic value exceeding 90 mmHg [1]. Blood pressure increases gradually over time, such as consuming excess sodium, insufficient potassium intake, overweight and obesity, drinking alcohol, and lack of physical activity [2]. Damage to the cardiovascular system such as stroke, myocardial infarction, heart failure, and even death is closely related to the incidence of hypertension experienced by the elderly. In the elderly, the adverse impacts that occur are strongly influenced by changes in organ systems such as arterial stiffness, mechanical, neurohormonal, and autonomic hemodynamic changes, dysregulation, and decreased function of the kidneys [3]. Hypertension is classified into two based on its causes, some can be classified by etiology and others cannot be classified. classified according to etiology [4]. The prevalence of hypertension is high in low and middle-income countries, cases of hypertension are more common in men, namely around 31.9%, compared to women, which is around 30.1%. Hypertension in men is highest in Eastern European and Central Asian countries at 39.0%, in women cases of hypertension are highest in sub-Saharan African countries at 36.3% [5].

According to the World Health Organization (WHO), around the world there are 1.13 billion people who suffer from high blood pressure and it is estimated that this will increase to 1.5 billion in 2025 [6] The hypertensive population in the Asian continent, such as in Malaysia, is 33.1%, in China is 31.5% and in India it is 28.5% [7] The increase in hypertension cases has doubled from 1990-2019 in the population aged 30-79 years, which initially numbered 317 million in men to 652 million. while women initially numbered 331 million to 626 million in 2019 [8] Riskesdas research in Indonesia said the incidence of hypertension with a minimum age of 18 years in the Bangka Belitung region was 30.9%, in the Papua region it was 16.8%, in Bali province, there were 19, 9% of cases of hypertension [9]. According to a survey conducted in 2018, it was found that 2,886 cases, or 10.45% of the total population living in East Jakarta experienced high blood pressure [10].

The hypertension factor does not stand alone, hypertension can occur due to the habit of consuming alcohol, smoking habits, consuming salt, consuming red meat, physical activity, and obesity, it can also be due to heredity, age, and gender differences. Someone who does not consume red meat has a 77% lower chance of developing hypertension, similarly, someone who does not consume alcohol has a 70% lower chance of developing hypertension and those

who have a BMI ≥ 25 have a 3.05 times greater chance of developing hypertension [11]. Other factors, such as genetics or an adverse intrauterine environment such as gestational hypertension or pre-eclampsia have a small but strong association with high blood pressure levels in adulthood [12].

Many factors can influence the occurrence of hypertension, plus the high incidence of hypertension has made the Indonesian government have a new goal, namely reducing the incidence of hypertension in Indonesia through the BPJS program known as the Chronic Disease Management Program or PROLANIS [13-15]. This series of management focuses on non-communicable phenomena such as hypertension [16].

Based on the explanation and data above, it was found that many factors support the occurrence of increased blood pressure. So the author is interested in carrying out research related to factors related to the incidence of hypertension in outpatients at the Kramat Jati District Health Center, East Jakarta in 2024.

1.1 Research Problem

The formulation of the problem based on the background obtained is "What factors are related to the incidence of hypertension in outpatients at the Kramat Jati District Health Center, East Jakarta in 2024"

1.2 Research Purposes

To find out the factors that most cause the incidence of hypertension in outpatients at the Kramat Jati District Health Center, East Jakarta in 2024

2. MATERIALS AND METHODS

2.1 Research Design

The research was obtained using cross-sectional analytical techniques using simultaneous measurements to determine the dynamics of the relationship between the dependent variable, namely the incidence of hypertension, and the independent variables, namely unmodified factors, such as age, gender, and family history of hypertension, as well as lifestyle factors that modified factors, such as salt consumption, physical activity, smoking.

The following is an explanation of several research indicators, including:

The hypertension criteria used in this study are the results of blood pressure measurements using a sphygmomanometer, where the systolic pressure is above 140 mmHg and the diastolic pressure is above 90 mmHg.

The way researchers determine a patient's sodium intake is by using a questionnaire that asks about how many grams of salt are intake/per day.

The physical activities referred to are such as walking, jogging, aerobics, cycling, and sports such as badminton, swimming

2.2 Location and Time of Research

This research was carried out at the Non-Communicable Diseases Polyclinic or Hypertension Polyclinic, Kramat Jati District Health Center, East Jakarta. Data collection took place for 2 weeks in February 2024.

2.3 Research Subjects

2.3.1 Population

The selected population was outpatients who had hypertension and were active as controls and non-hypertensive outpatients who visited the Kramat Jati District Health Center, East Jakarta. The population was found to be 136 people.

2.3.2 Research sample

The sample was selected from the population who were willing to participate and met the inclusion criteria. Inclusion and exclusion criteria are as follows:

2.3.3 Inclusion criteria

1. Outpatients at the Non-Communicable Diseases Polyclinic or Hypertension Polyclinic, Kramat Jati District Health Center, East Jakarta.
2. Adults to the elderly, namely patients aged ≥26 years to ≥65 years.
3. The patient is willing to be a sample in the research.
4. Compos mentis awareness, cooperative ability to listen and respond.

2.3.4 Exclusion criteria

1. Do not agree or do not fill out the informed consent form.

2. Not an outpatient at the Kramat Jati District Health Center, East Jakarta

2.3.5 Sampling Technique

The sample determined was outpatients at the Kramat Jati District Health Center, East Jakarta. Samples were collected using a non-random accidental sampling technique where the sampling technique was planned by the researcher and not random.

2.4 Data Collection

Primary data was directly obtained from research subjects using a questionnaire sheet to determine the characteristics and lifestyle of outpatients which influence the incidence of hypertension.

2.5 Data Processing and Analysis

SPSS (Statictical Package for the Social Sciences) 29th version was used to view research results using univariate and bivariate analysis. Univariate analysis in this study looked at the frequency of each existing independent variable, while bivariate analysis was used to see whether or not there was a relationship between the incidence of hypertension and the independent variables.

3. RESULTS AND DISCUSSION

3.1 Research Results

This research uses univariate analysis to see the frequency of each variable and bivariate analysis to describe whether or not there is a relationship between the two variables.

3.1.1 Univariate analysis

This analysis is also called descriptive statistics. The purpose of this analysis is to describe the conditions of the phenomenon under study. The following are the results of the univariate analysis for each variable:

3.1.1.1 Age

Based on Table 1 above, this research shows that the age variable consists of 5 or 5% of respondents aged 26-35 years, 12 or 11.9% of respondents aged 36-45 years, 27 or 26.7% of respondents aged 46-55 years, 29 or 28.7% of respondents were aged 56-65 years and 28 or 27.7% of respondents were aged >65 years.

Table 1. Frequency distribution of respondents based on age

Age	Frequency	Percentage (%)
26-35	5	5.0
36-45	12	11.9
46-55	27	26.7
56-65	29	28.7
>65	28	27.7
Total	101	100.0

3.1.1.2 Gender

Based on Table 2 above, this research shows that the respondent gender variable is known to consist of 66 or 65.3% female respondents and 35 or 34.7% male respondents.

Table 2. Frequency distribution of respondents based on gender

Gender	Frequency	Percentage (%)
Female	66	65.3
Male	35	34.7
Total	101	100.0

3.1.1.3 Family history of hypertension

Based on Table 3 above, this research shows that the variable history of hypertension in the respondent's family is known to consist of 48 or 47.5% of respondents who have no history and 53 or 52.5% of respondents who have a history.

Table 3. Frequency distribution based on family history of hypertension

History of Hypertension	Frequency	Percentage (%)
No	48	47.5
Yes	53	52.5
Total	101	100.0

3.1.1.4 Diet sodium

Based on Table 4 above, this research shows that the sodium diet variable shows that respondents consist of 30 or 29.7% of respondents who consume <5 grams of salt and 71 or 70.3% of respondents who consume ≥5 grams of salt.

Table 4. Frequency distribution of respondents based on sodium diet

Diet Sodium	Frequency	Percentage (%)
<5 gram	30	29.7
≥5 gram	71	70.3
Total	101	100.0

3.1.1.5 Physical activity

Based on table 5 above, this research shows that the physical activity variable shows that respondents consist of 24 or 23.8% of respondents who do not do physical activity and 77 or 76.2% of respondents who do physical activity.

Table 5. Frequency distribution of respondents based on physical activity

Physical Activity	Frequency	Percentage (%)
No	24	23.8
Yes	77	76.2
Total	101	100.0

3.1.1.6 Smoking history

Based on Table 6 above, this research shows that the respondent smoking history variable is known to consist of 69 or 68.3% of respondents who are not active smokers and 32 or 31.7% of respondents who are active smokers.

Table 6. Frequency distribution of respondents based on smoking history

Smoking	Frequency	Percentage (%)
No	69	68.3
Yes	32	31.7
Total	101	100.0

3.1.1.7 Hypertension status

Based on Table 7 above, this study shows that the hypertension variable is known to respondents consisting of 20 or 19.8% of respondents who do not experience hypertension and 81 or 80.2% of respondents who experience hypertension.

3.1.2 Bivariate analysis

This analysis is used to find out whether there is a relationship between the two variables. The following are the results of the research analysis.

3.1.2.1 Relationship between Age and the Incident of Hypertension

Based on Table 8 of the Chi-Square test for the age variable, it is known that the test used is for the 5x2 table, using Pearson Chi-Square, namely 0.0001 (<0.05), which means there is a significant relationship between the incidence of hypertension and each age category. Inferential tests obtained on the age variable on the incidence of hypertension showed that the Odds Ratio value was 10.571, which means that respondents aged >45 years had a 10.5 times greater risk of developing hypertension.

Table 7. Frequency distribution of respondents based on the incident of hypertension

Hypertension Status	Frequency	Percentage (%)
Not Hypertension	20	19.8
Hypertension	81	80.2
Total	**101**	**100.0**

3.1.2.2 Relationship between gender and the incidence of hypertension

Based on Table 9 of the ChiSquare test for the gender variable, it is known that the test used was for a 2x2 table and no Expexted value was found <5, so using Continuity Correction the value was 0.410 (>0.05), which means there is no significant relationship between the incidence of hypertension and respondents who are male or female. In the gender variable regarding the incidence of hypertension, it is known that the Odds Ratio value is 0.578, which means that female respondents have a higher risk of developing hypertension, namely 0.57 times compared to men.

3.1.2.3 Relationship between family history of hypertension and the incidence of hypertension

Based on table 10 of the ChiSquare test for the family history of hypertension variable, it is known that the test used was for a 2x2 table and no Expexted value was found <5, so using Continuity Correction the value was 0.046 (<0.05), which means there is a significant relationship between the incidence of hypertension with respondents who have a family history of hypertension. In the family history of hypertension variable, it is known that the Odds

Ratio value is 3.225, which means that respondents with a family history of hypertension are at 3.2 times greater risk of developing hypertension.

3.1.2.4 Relationship between dietary sodium patterns and the incidence of hypertension

Based on Table 11 of the Chi-Square test for the sodium diet variable, it is known that the test used was for a 2x2 table and no Expected value <5 was found, so using Continuity Correction the value was 0.0001 (<0.05), which means there is a significant relationship between events. hypertension with respondents who consumed sodium in amounts <5 grams or consumed sodium in amounts ≥5 grams. The inferential test on the sodium dietary pattern variable on the incidence of hypertension shows that the Odds Ratio value is 6.992, which means that respondents who consume sodium in amounts ≥5 grams/day are 6.9 times more likely to suffer from hypertension**.**

Table 8. Relationship between age and the incident of hypertension

Age	Hypertension		Total	Asymptotic significance (2- sided)	Odds Ratio
	No	Yes			
26-35	5	0	5		
36-45	5	7	12		
46-55	5	22	27	0.0001	10.571
56-65	3	26	29		
>65	2	26	28		

Table 9. Relationship between gender and the incidence of hypertension

Gender	Hypertension		Total	Asymptotic significance (2- sided)	Odds Ratio
	No	Yes			
Female	11	55	66		
				0.410	0.578
Male	9	26	35		

Table 10. Relationship between family history of hypertension and the incidence of hypertension

History of Hypertension	Hypertension		Total	Asymptotic significance (2- sided)	Odds Ratio
	No	Yes			
No	14	34	48		
				0.046	3.225
Yes	6	47	53		

Table 11. Relationship between dietary sodium patterns and the incidence of hypertension

Dietary Sodium Patterns	Hypertension		Total	Asymptotic significance (2- sided)	Odds Ratio
	No	Yes			
< 5 gram	13	17	30		
				0,0001	6.992
≥ 5 gram	7	64	71		

Table 12. Relationship between physical activity and hypertension

Physical Activity	Hypertension		Total	Asymptotic significance (2- sided)	Odds Ratio
	No	Yes			
No	4	20	24		
				0,454	0,763
Yes	16	61	77		

Table 13. Relationship between smoking activities and the incidence of hypertension

Smoking Activities	Hypertension		Total	Asymptotic significance (2- sided)	Odds Ratio
	No	Yes			
No	18	51	69	0,039	5,294
Yes	2	30	32		

3.1.2.5 Relationship between physical activity and hypertension

Berdasarkan tabel 3.12 dari uji ChiSquare variabel aktivitas fisik diketahui bahwa uji yang digunakan adalah untuk tabel 2x2 dan ditemukan nilai Expexted <5, maka menggunakan Fisher Exact Test yaitu 0,454 (>0,05), yang artinya tidak terdapat hubungan signifikan antara kejadian hipertensi dengan responden yang melakukan aktivitas fisik. Pada variabel ini diketahui nilai Odds Ratio sebesar 0,763 yang berarti responden yang beraktivitas mempunyai potensi 0,76 kali lebih besar mengalami hipertensi.

3.1.2.6 Relationship between smoking activities and the incidence of hypertension

Based on table 13 of the ChiSquare test for the smoking activity variable, it is known that the test used was for the 2x2 table and no Expexted value <5 was found, so we used Continuity Correction, namely 0.039 (<0.05), which means there is a significant relationship between the incidence of hypertension and the respondent who ever smoked actively or never smoked actively. In the smoking history variable on the incidence of hypertension, it is known that the Odds Ratio value is 5.294, which means that respondents who are exposed to cigarette smoke have a 5.2 times higher risk of developing hypertension.

4. DISCUSSION

4.1 Relationship between Age and the Incident of Hypertension

In this study, it was found that 5% of subjects were aged 26 to 35 years, 11.9% of subjects were aged 36 to 45 years, 26.7% of subjects were aged 46 to 55 years, 28.7% of subjects were aged 56 to 65 years and 27.7% of subjects were over 65 years old. There is a significant relationship between the incidence of hypertension and each age category with the result of Asymptotic significance (2-sided), namely 0.0001 (<0.05). Research on the incidence of hypertension found that subjects over 45 years of age had a 10.5 times greater risk than respondents under 45 years of age. This research is in line with Cohen et al's research that the 40-44-year age group has the highest risk of developing hypertension because the human body becomes less responsive to stimuli as age increases, causing reduced sympathetic regulation in older individuals [17]. The results of Rahmawat et al's research are inconsistent, showing that those aged 20 to 40 years are more likely to experience hypertension due to unhealthy lifestyle habits such as not liking activities, smoking continuously, malnutrition, stress, and abnormalities in imaging results in the heart and brain which increase cardiovascular events in the elderly [18]. Age is calculated from the time a person is born until their birthday, where the older a person is, the more mature their thoughts and behavior become [19]. As age increases, there is also a process of dysfunction where there is a decrease in the regulation of repair mechanisms, thereby increasing the possibility of disease and causing an increase in the death rate [20].

4.2 Relationship between Gender and the Incidence of Hypertension

In this study, it was found that 65.3% of the subjects were female and 34.7% were male. According to the relationship, a value of 0.410 (>0.05) was obtained, which means there is no significant relationship between the incidence of hypertension and respondents who are male or female. In the gender variable, it was found that female respondents had a higher risk of developing hypertension, namely 0.57 times compared to men.

Research by Mouhtadi et al agrees with this research where it is stated that hypertension attacks women the most because women leave the house less often and do not exercise as much, so they are at risk of developing hypertension [21]. Kusumawaty et al.'s research also agrees with the current study which shows that the incidence of hypertension in women is higher, namely from 92 samples found 54 women had hypertension and 38 men had hypertension. Kusumatay et al said that gender

is closely related to the occurrence of hypertension because women suffer from hypertension during menopause due to a decrease in the hormone estrogen so they cannot maintain levels of High-Density Lipoprotein whose function is a protective factor in preventing atherosclerosis and blood vessel damage [22]. Gender is a division of subjects that is distinguished from the structure of chromosomes, namely the structure of the cell nucleus, where genes are carriers of inherited traits. Men and women can be differentiated based on two different chromosomes, women have both X sex chromosomes, for men the two chromosomes are different, namely the X chromosome and the Y chromosome. Female genetic carriers are the X chromosome type and the Y chromosome in men [23].

4.3 Relationship between Family History of Hypertension and the Incidence of Hypertension

This study shows that the variable history of hypertension in the family of respondents is known to consist of 48 or 47.5% of respondents who have no history and 53 or 52.5% of respondents who have a history. According to the relationship, there is a significant relationship between the incidence of hypertension and respondents who have a family history of hypertension. In this study, it was also found that respondents with a family history of hypertension were 3.2 times more likely to develop hypertension. Li et al's research agrees with this research where it was found that individuals with a family history of hypertension had an odds ratio of 4.103, which means that people with a family history of hypertension are 4.1 times more likely to develop hypertension [24].

Liu et al's research also agrees with this research which shows that patients with a family history of hypertension are 2-4 times more likely to develop hypertension. A study by Liu et al found that the relationship between the risk of hypertension based on a family history of hypertension was stronger in women than in men and this relationship appeared to occur more frequently in the first generation [25]. According to research by Rodríguez-Moran et al, it shows that a family history of hypertension inherited from the mother is associated with hyperinsulinemia (OR 1.5), which means a 1.5-fold increase in risk of developing hypertension, high blood pressure, and hypertension (OR 4.0), which means a 4-fold increase in risk. high levels of hypertension, hypertriglyceridemia (OR 1.6) which means a 1.6 times higher risk of hypertension, and low high-density lipoprotein cholesterol (OR 1.3) which means a 1.3 times higher risk of developing hypertension. These researchers concluded the hypothesis that cardiovascular risk phenotypes are inherited from the mother via mitochondria is still unclear and the mechanisms underlying gender-related differences require further research [26].

Maternal factors such as food intake, central adiposity, and placental insufficiency during pregnancy contribute significantly to the programming of disease phenotypes in the offspring. Fetal growth is determined by the interaction between the fetal genome and its environment, which is determined by the mother's environment as well as the physiology of the mother and placenta. Many underlying assumptions have a big impact on overcoming metabolic and cardiovascular diseases. So further research is still needed to determine the evolution, etiology, and associated risk factors [27]. The genome also has an influence on the occurrence of hypertension, when one gene co-segregates with one trait in a family, this results in the gene being linked to that trait and there is likely a causal relationship [28]. There is a serine proteinase encoded by the gene which functions to inhibit the activity of tissue type I plasminogen activator. The encoded protein forms the bulk of lipoprotein(a) and then through a proteolytic process is cleaved and produces fragments that attach to atherosclerotic lesions and cause thrombogenesis. According to research by Antonicelli et al, Lp (a) and peroxidative stress may be involved as cofactors in essential hypertension [29]. A family history of hereditary hypertension is a condition of hypertension that originates in the family, if it is not inherited from the family then it cannot be said to be a family history. Genetic factors do not completely influence the history of hypertension, but other factors support it. High blood pressure is often lowered but we can avoid it by controlling blood pressure regularly and maintaining a healthy pattern [30].

4.4 Relationship between Dietary Sodium Patterns and the Incidence of Hypertension

In this study, it was found that 29.7% of subjects consumed <5 grams of sodium per day, and it was also found that 70.3% of subjects consumed ≥5 grams of sodium per day. According to the relationship, there is a relationship between subjects who consume sodium in amounts <5

grams or ≥5 grams and the incidence of hypertension with the result of Asymptotic significance (2-sided) namely 0.0001 (<0.05). In this study, it was found that subjects who consumed ≥5 grams of sodium per day had a 6.9 times greater chance of developing hypertension than subjects who consumed <5 grams of sodium per day. Pertiwi et al's research agree with this research, where hypertensive patients who consumed high amounts of salt in healthcare facilities experienced a large increase in systolic blood pressure at each visit, p-value = 0.038 (<0.05) [31].

Farapti et al's research disagrees because it shows there is no correlation between salt intake and blood pressure, but a significant correlation was found between Na/K ratio levels, not with sodium and potassium levels separately. Blood pressure increases 3.99 times for every 1 unit increase in the Na/K ratio in the urine [32]. Wahyu et al's research shows that people with hypertension tend to reduce sodium intake to prevent disease complications. This eating pattern will influence the relationship between sodium intake and the incidence of hypertension. This relationship may be influenced by body weight status or the presence of metabolic disorders. In this study, most of the respondents with low fat intake were overweight and obese [33].

A person who consumes more salt than is excreted through the kidneys increases blood vessel volume and cardiac output. Due to an increase in vascular volume and cardiac output, the body's response is an increase in blood pressure. Salt not only affects vascular mechanisms but also activates neural, endocrine, or paracrine responses [34]. Consuming excessive amounts of salt such as >10 grams is found in people who often consume instant foods, anchovies, cuttlefish, shrimp, and noodles with soy sauce [35]. According to research Shafrina et al. The average amount of salt consumption in Southeast Asia varies, such as in Indonesia, from 1.94 g/day to >5 g/day [34]. High sodium intake is associated with increased blood pressure levels due to changes in vascular resistance, sodium consumption can trigger water retention and cause arteries to experience high flow, changes in plasma sodium levels not only impact small resistance arteries but can also affect function and structure large elastic arteries. Other side effects of consuming excessive amounts of sodium are microvascular endothelial inflammation, anatomical remodeling, and functional abnormalities [36].

4.5 Relationship between Physical Activity and the Incidence of Hypertension

In this study, it was found that 23.8% of subjects did not exercise either regularly or not at all, and also 76.2% of subjects exercised either regularly or irregularly. According to the relationship, there is no significant difference in the possibility of hypertension between subjects who do or do not do physical activity with the result of Asymptotic significance (2-sided) namely 0.454 (>0.05). Subjects who are active have a 0.76 times risk of developing hypertension. Changes in blood pressure during exercise are the difference between peak and initial systolic blood pressure of at least 60 mmHg in men and at least 50 mmHg in women during exercise testing, or it is also said that systolic blood pressure in men exceeds 210 mmHg and in women exceeds 190 mmHg. This research according to Caselli et al is in line with this research because subjects who do a physical activity can increase systolic blood pressure [37]. The normal value of blood pressure during maximum exercise testing is 220/85 mmHg in male athletes and 200/80 mmHg in female athletes. The increase in blood pressure increases for a short period, especially during heavy lifting activities, blood pressure values usually increase to 480/350 mmHg [38].

Purba et al.'s research states that there is a relationship between the incidence of hypertension and physical activity. The OR value was 3.619, which means that people who do light exercise have a three times greater risk of developing hypertension compared to people who do moderate and heavy activities [39].

Light physical activity or a sedentary lifestyle is an activity that spends time sitting or standing with little body movement, not exercising, and using vehicles. Heavy physical activity is someone who is active and works hard for a long period. Physical activity affects blood pressure, heart rate is usually higher in people who are not active. High blood pressure is caused by hardening of the heart muscle which functions to pump, thereby placing a burden on the artery walls and peripheral resistance. Not doing physical activity can also cause obesity which affects blood pressure [39].

4.6 Relationship between Smoking Activities and the Incidence of Hypertension

In this study, it was found that 68.3% of subjects were not active smokers and 31.7% of subjects

were active smokers. According to the relationship, there is a significant difference between patients who are active and inactive smokers with the incidence of hypertension with the result of Asymptotic significance (2-sided) namely 0.039 (<0.05). According to this study, subjects who were exposed to cigarette smoke were 5.2 times more likely to develop hypertension. Misnaniarti et al's research agrees with this research where the risk of hypertension is two times greater in smokers. There is also a relationship between the two with logistic regression showing that smoking has an increased risk of developing hypertension by 20% (OR = 1.97; 95% CI = 1.01-1.41; p = 0.034) [40].

Octavian et al's research also states that there is a significant relationship between smoking and blood pressure (p=0.003). This is proven by an increase in blood pressure measurements from 140 ± 7/99 ± 3 mmHg to 151 ± 5/108 ± 2 mmHg after 10 minutes of inhaling cigarette smoke [41].

The nicotine in cigarettes affects a person's blood pressure. This may be caused by atherosclerosis which appears due to plaque, other effects occur in the release of the hormones epinephrine and norepinephrine or the effect of CO on red blood cell proliferation [41-44]. Long-term tobacco use affects the adaptability of blood vessels through endothelial damage and chronic inflammation [45-48]

The advantages of this research include that it can be used as reading material to broaden your horizons and serve as a guide for the process of creating strategies for treating and preventing hypertension. Specifically for community health centers, where they can improve information, education and counseling for patients and the public, especially for patients who are elderly and have hypertension complications. Apart from the advantages of the research, of course there are still several weaknesses, namely that it has not explored the risk factors for high blood pressure very deeply, so it is recommended for future researchers to study more deeply with different methods the risk factors for hypertension.

5. CONCLUSION

There is a significant relationship between factors that unmodified factors, namely age and family history of hypertension, with the incidence of hypertension at the Kramat Jati District Health Center, East Jakarta, and there is also a significant relationship between factors that can be changed, namely dietary sodium patterns and smoking activities, and the incidence of hypertension in Kramat Jati District Health Center, East Jakarta.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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