

The Relationship between Age, Gender, Obesity, Physical Activity, Smoking, Vegetable and Fruit Consumption with Hypertension

Evi Heryanti^a, Kusharisupeni Djokosujono^a

^aDepartment of Public Health Nutrition, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

E-mail: evi.heryanti71@ui.ac.id

Abstract: On a global scale, hypertension is one of the highest causes of death due to heart disease, stroke and kidney failure. According to WHO (2011) about one third of the population of adults in Southeast Asia has hypertension. According to Riskesdas (2013), prevalence of hypertension in West Java Province was 29.4%, exceeding the national figure of 25.8%. This study aims to analyze the risk factors for hypertension in West Java Province in 2016. This research used secondary data from Posbindu PTM surveillance in 2016, sample for this research were aged 18-60 years. The approach used was the cross-sectional study. This analysis uses chi square method and multivariate logistic regression. Result of this study showed there is no correlation between vegetable and fruit consumption with hypertension ($p=0.061$). There is correlation between age ($p=0.001$), gender ($p=0.001$), obesity ($p=0.002$), physical activity ($p=0.001$) and smoking ($p=0.001$) with hypertension. The dominant factor in the incidence of hypertension is age. It is recommended to check health at the beginning and periodically and apply a healthy lifestyle, especially for those who already have risk factors for hypertension.

Keywords: Hypertension, risk factors, determinants, West Java

INTRODUCTION

Blood pressure is the force of blood against the arterial wall when circulating through the body. High blood pressure or hypertension is a constant pumping of blood through blood vessels with excessive force. Hypertension is the increase in systolic blood pressure is greater than 140 mmHg and / or diastolic is greater than 90 mmHg on two measurements with an interval of 5 minutes in a state of adequate rest [1]

Hypertension does not always cause symptoms, many people do not know that they are suffering from hypertension. Therefore hypertension is also called "the silent killer". High blood pressure also has a serious health impact on society because it is a risk factor for stroke, heart disease and kidney failure.

13% of the deaths of people worldwide are caused by hypertension, it is a very important topic for public health in developing developed countries [2]. Nearly one billion people worldwide have high blood pressure, two-thirds are in developing countries, and it is estimated that by 2025 it will increase to 1.56 billion people who suffer from hypertension. In Europe, high blood pressure is a problem because it has been shown to have a prevalence increase of 60% when compared with the US and Canada [3]. In Southeast Asia (SEA), hypertension almost kills 1.5 million people every year [4]. Based on Riset Kesehatan Dasar (2013), the prevalence of hypertension in West Java Province was 29.4%, higher than the national figure of 26.5% [5].

METHOD

This study is using surveillance data Posbindu of West Java Province in 2016 with a cross-sectional study design. Total respondents are 34.949 who registered at the Posbindu PTM West Java Province in 2016. We using fulfill the inclusion criteria 10.516 people aged 16-80 years recruited from a Posbindu PTM.

Data taken in this study included age, sex, physical activity, vegetable and fruit consumption, weight, smoking behavior, systolic blood pressure, and diastolic blood pressure. Independent variables in this study were age, gender, obesity, physical activity, smoking and consumption of vegetables and fruit. Dependent variable is hypertension. The aim of this study was to determine the risk factors for the incidence of hypertension in West Java Province in 2016.

Hypertension data was taken as characteristic data of subjects obtained from measurements of systolic and diastolic blood pressure, systolic blood more than or equal to 140 mmHg and / or diastolic blood pressure

more than or equal to 90 mmHg. Data were analyzed using univariate, bivariate and multivariate analysis. Univariate analysis to see the average, minimum and maximum values and frequency distribution. Bivariate analysis is used to determine the relationship group of hypertension with those without hypertension. Multivariate analysis is used to determine the dominant factors that influence hypertension.

RESULT

Characteristics of Research Subject

The results of the study found that 51.6% of respondents refer to hypertension and 48.4% were not hypertension. The distribution of the incidence of hypertension is shown in Table 1 below:

Table 1: Distribution of Respondents based on the incidence of hypertension in West Java Province in 2016.

Hypertension	Total	
	n	%
No	5087	48.4
Yes	5429	51.6
Total	10516	100

In Table 2, the average age of respondents in this study is 44.3 with a standard deviation of 10.9 years. Youngest age 18 years and oldest age 60 years. The average body weight of the respondents was 58.9 kg with a standard deviation of 10.8 kg, with the lowest body weight of 40 kg and the highest of 114 kg. Average height of respondents which is 154.6 cm with a standard deviation of 6.9 cm. Minimum height is 140 cm and maximum is 185 cm. The average systolic blood pressure of the respondents was 132.7 mmHg with a standard deviation of 24.6 mmHg, the lowest systolic blood pressure was 80 mmHg and the highest was 260 mmHg. The average diastolic blood pressure of respondents is 83.1 mmHg with a standard deviation of 11.6 mmHg, the lowest systolic blood pressure is 60 mmHg and the highest is 150 mmHg.

Table 2: Average Distribution by Age, Weight, Height, Systolic and Diastolic Blood Pressure in West Java Province in 2016.

Variables	Mean $\pm$ SD	Minimum-Maximum
Age	44.3 $\pm$ 10.9	18 - 60
Weight	58.9 $\pm$ 10.8	40 - 114
Height	154.6 $\pm$ 6.9	140 - 185
Systolic	132.7 $\pm$ 24.6	80 - 260
Diastolic	83.1 $\pm$ 11.6	60 - 150

Characteristics of respondents in this study include: age, gender, obesity, physical activity, smoking and consumption of vegetables and fruit, as shown in Table 3 below:

Table 3: Frequency Distribution by Age, Gender, Obesity, Physical Activity, Smoking and Vegetable and Fruit Consumption.

Variables	n	%
Age		
< 45 Years	4658	44.3
$\geq$ 45 Years	5858	55.7
Gender		
Women	8269	78.6
Men	2247	21.4
Obesity		
No	5725	54.4
Yes	4791	45.6
Physical Activity		
Enough	5293	50.3
Less	5223	49.7
Smoking		
No	8838	84.0
Yes	1678	16.0
Vegetables and Fruits Consumption		
Enough	5849	55.6
Less	4667	44.4

Table 3 shows that the majority of respondents were in the age group ≥ 45 years, namely 5858 people (55.7%), the highest sex were women namely 8269 people (78.6%), most respondents were not obese, 5725 people (54.4%), respondents with adequate physical activity, namely 5849 people (55.6%), most respondents did not have smoking habits, namely 8838 people (84.0%), and most respondents were 5849 people (55.6%) enough to consume vegetables and fruits.

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Table 4: Relationship of Age, Gender, Obesity, Physical Activity, Smoking Status and Vegetables and Fruits Consumption with Hypertension in West Java Province 2016.

Variables	Hypertension				OR	P Value	95% CI
	No		Yes				
	n	%	n	%			
Age							
< 45 Years	3036	65.2	1622	34.8	3.474	0.001	3.205 - 3.766
≥ 45 Years	2051	35.0	3807	65.0			
Gender							
Men	915	40.7	1332	59.3	0.675	0.001	0.614 - 0.741
Women	4172	50.5	4097	49.5			
Obesity							
No	2847	49.7	2878	50.3	1.127	0.002	1.043 - 1.217
Yes	2240	46.8	2551	53.2			
Physical Activity							
Enough	2415	45.6	2878	54.4	0.801	0.001	0.742 - 0.865
Less	2672	51.2	2551	48.8			
Smoking							
No	4428	50.1	4410	49.9	1.553	0.001	1.396 - 1.727
Yes	659	39.3	1019	60.7			
Vegetables and Fruits Consumption							
Enough	2877	49.2	2972	50.8	1.076	0.061	0.996 - 1.162
Less	2210	47.4	2457	52.6			

The table above shows the relationship between independent variables with hypertension. Based on the results of the chi square test showed that there was a significant relationship between age, sex, physical activity and smoking with hypertension with each having a value of $p = 0.001$. Obesity was also proven to have a significant relationship with hypertension with a p value of 0.002. However, consumption of fruit and vegetables did not have the significant relationship with hypertension with a p value of 0.061.

Based on the results of the analysis, the age variable obtained an OR value of 3.5 means that the age of tahun 40 years has an odds of 3.5 times higher for experiencing the incidence of hypertension compared to subjects aged <40 years. This is in line with the research of Sartik et al. In his research on risk factors and the incidence of hypertension in Palembang residents, which showed that there was a significant relationship between age and the incidence of hypertension [6]. This was in line with Cohen et al's study which concluded that the incidence of hypertension was higher in older people because the hypertension fraction caused by modifiable lifestyle factors decreases with age [7]. Aging had a major impact on arteries because of an increase in collagen cells in the arteries and decreased endothelial function. Endothelial dysfunction is characterized by a decrease in the activity or bioavailability of nitric oxide originating from the endothelium. Nitric oxide functions in maintaining the elasticity of blood vessels [8].

Gender has an OR of 0.7 means that respondents with female gender have 0.7 times higher odds to experience the incidence of hypertension compared with male. The results of this study are in accordance with Prasetyaningrum's statement (2014) which states that men are more at risk of developing hypertension than women at the age of <45 years. But at the age of > 65 years, women are more at risk of developing hypertension than men. After women enter a monopause period the prevalence in women will increase due to hormonal factors [9]. This is not in line with the research conducted by Susyani et al. (2012) whose results show that there is no significant relationship between sex and the incidence of hypertension where p value = 0.404. Men are more at risk of developing hypertension when they are under 50 years old, while women are more at risk if they are over 50 years old [10]. Women before entering menopause, tend to be protected from hypertension. But after menopause, an increase in the prevalence of hypertension in women will be the same as that of men. Increased blood pressure after menopause, caused by several possibilities, namely a decrease in the hormone estrogen, an excessive response to androgens, an increase in oxidative stress and endothelin and changes in the renin angiotensin system [11].

Obesity has OR 1.1 which means that respondents with obesity have an odds of 1.1 times higher to experience the incidence of hypertension compared to respondents who are not obese. This is in line with Kamarullah's research in 2017 which concluded that obese people tend to be 10.13 times more likely to suffer from hypertension than those who are not obese [12]. Obesity is very closely related to an unbalanced diet. An experiment showing a 1% reduction in body weight would result in a decrease of 1 mmHg for systolic pressure and 2 mmHg for diastolic pressure [13].

Physical activity has an OR value of 0.8 meaning that subjects with less physical activity have odds 0.8 times higher to experience the incidence of hypertension compared to subjects with sufficient physical

activity. This is in line with Pramana's research in 2016 which obtained a value of $p = 0.013 < 0.05$, indicating that there was a significant relationship between physical activity and the level of hypertension [14]. In adults, low levels of physical activity are associated with an increase in metabolic and inflammatory syndromes. Physical activity can improve fitness levels and reduce heart risk and decrease body mass index. Several mechanisms that explain the mechanism of physical activity against hypertension include a decrease in the sympathetic nerve, an increase in nitrite oxidants and an increase in insulin sensitivity [15].

The OR value of smoking is 1.5, meaning that subjects who smoke have odds 1.5 times higher for experiencing the incidence of hypertension compared to non-smoking subjects. This is in line with Sartik et al's research which states that there is a statistically significant relationship between smoking habits and the incidence of hypertension ($p = 0.026$; OR = 1.77 and 95% CI = 1.06-2.95) [6]. However, it is not in line with Kamarullah's research which states that there is no significant relationship between smoking and the incidence of hypertension ($p = 1,000$; OR = 0.940; 95% CI = 0.473 - 1,871) [12]. Smoking causes sympathetic nerve activation, oxidative stress, and the acute effects of vasopressor associated with increased inflammation that can cause hypertension. Long-term smoking causes abnormalities of myocardial blood flow, which may be due to disorders of the vascular endothelium. Cigarette smoking also increases arterial blood pressure with stiff arteries, with a very damaging effect on chronic smokers. Smoking at a young age is associated with arterial changes and increased general carotid intima-media artery thickness in adulthood. Smoking in adults is also associated with the development of atherosclerosis, and these detrimental effects can be cumulative [16].

Consumption of vegetables and fruit has OR 1.1, meaning that the subject with consumption of vegetables and fruits that have less than 1.1 times the odds of experiencing the incidence of hypertension compared to subjects with adequate consumption of vegetables and fruits. Based on the results of the chi square test between consumption of vegetables and fruit with the incidence of hypertension, there was no significant relationship between vegetable and fruit consumption with the incidence of hypertension ($p = 0.061$). This research is in line with Jiwon Kim's research (2018) entitled Association Between Fruit and Vegetable Consumption Risk of Hypertension in Middle-Age and Older Korean Adult, which states that there is no relationship between vegetable consumption and the risk of hypertension in men or women [17]. But this is not in accordance with Rosihan Anwar (2014) in his research which states that there is a meaningful relationship between consumption of vegetables and fruit [18]. In theory, consumption of antioxidants derived from vegetables can reduce endothelial damage caused by high consumption of fat [19]. Although vegetables also contain various vitamins and minerals, vegetables are usually cooked using spices such as salt and soy sauce which contain high sodium which is associated with increased blood pressure [20].

The Dominant Factor of Hypertension

Based on the results of bivariate analysis there were six variables that had a value of $p < 0.25$ including age, gender, obesity, physical activity, smoking and consumption of vegetables and fruit. As shown in the following table:

Table 5. Candidates for Multivariate Analysis

Variables	P Value
Age	0.001
Gender	0.001
Obesity	0.002
Physical Activity	0.001
Smoking	0.001
Vegetables and Fruits Consumption	0.061

In the multivariate stage, all variables that have fulfill the bivariate selection are analyzed together in the model. The modeling results as shown in Table 6 below:

Table 6: First Modeling Logistic Regression Modeling.

Variables	B	P Value	OR	95% CI
Age	1.231	0.001	3.423	3.16 - 3.71
Gender	0.110	0.116	1.116	0.97 - 1.28
Obesity	0.097	0.021	1.101	1.01 - 1.19
Physical Activity	0.164	0.001	1.179	1.09 - 1.28
Smoking				

Vegetables and Fruits Consumption	-0.360	0.001	0.698	0.59 - 0.81
	-0.083	0.050	0.921	0.85 - 1.00

Furthermore, elimination/ selection of variables which p value > 0.05 from the first model shows the sex with p value > 0.05 which is 0.116 so it must be excluded from modeling. Then the changes in OR values were seen between before and after the sex variable was removed from the model. The results of the calculation of changes in OR values, it turns out that none of the variables changed > 10%, so sex variables are still excluded from modeling. So the final modeling results are as follows:

Table 7: Final Modeling of Results of Multivariate Test Analysis Model Determination of Surveillance Data of Posbindu PTM West Java Province in 2016.

Variables	p Value	OR	95% CI
Age	0.001	3.437	3.169 - 3.729
Obesity	0.028	1.096	1.010 - 1.190
Physical Activity	0.001	1.182	1.089 - 1.282
Smoking	0.001	0.572	0.572 - 0.719
Vegetables and Fruits Consumption	0.049	0.847	0.847 - 1.000

Based on the results of multivariate analysis it turns out that variables that have a significant relationship with the incidence of hypertension are age, obesity, physical activity, smoking and consumption of vegetables and fruit. The variable that has the greatest influence on the incidence of hypertension is the age variable. The results of the analysis found that Odds Ratio (OR) of the age variable 3.44 (95% CI 3.2-3.7), meaning that respondents aged ≥ 45 years would have Odds experiencing hypertension incidence 3.44 times higher than respondents aged <45 years . The results of multivariate logistic regression determinant models of all independent variables indicate that age is the dominant factor in hypertension with a p value of 0.001 and an OR of 3.44.

CONCLUSION

The proportion of the incidence of hypertension in West Java Province in 2016 was 51.6%. The dominant factor in the incidence of hypertension is age. It is recommended to check health in the beginning and periodically and apply a healthy lifestyle, especially for those who already have risk factors for hypertension.

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