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Modifiable and Unmodifiable Variable Analysis of Hypertension Incidence

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Abstract

BACKGROUND: Blood pressure may cause 7.5 million deaths and around 12.8% are deaths. The hypertension will continue and it is predicted in 2025, there are 29% of adults worldwide will be affected by hypertension. Based on data from Arosuka District Hospital in Solok, there were 133 (14.31%) patients with hypertension.

AIM: The purpose of this research was to determine factors influence hypertension.

METHODS: The type of this research was cross-sectional. The populations were all of hypertensive patients who visited the Arosuka District Hospital. They were 133 samples. They had been chosen using total sampling. Then, the data were analyzed by univariate and bivariate through Chi-square and multivariate tests with binary logistic regression.

RESULTS: The results showed that the variables related to hypertension were age (elderly = 66.2%, p = 0.0001, OR = 0.107), gender (female = 63.9%, p = 0.0001, OR = 3.917), index body mass (overweight = 69.2%, p = 0.0001, OR = 4.451), exercise (not exercising = 57.9%, p = 0.020, OR = 2.296), smoking (not smoking = 63.9%, p = 0.0001, OR = 0.255), and heart disease (undiagnosed = 87.2%, p = 0.005, OR = 7.000). In short, the variable related to hypertension were age (p = 0.0001, OR = 0.114), body mass index (p = 0.032, OR = 2.737), and heart disease (p = 0.002, OR = 12.231).

CONCLUSION: In conclusion, the most influential factor toward hypertension was heart disease. Prevention is done by having a heart-healthy diet, controlling blood pressure, maintaining a normal body weight, quitting smoking, and being diligent in doing physical activity.

Introduction

The prevalence of hypertension will continue to increase sharply and it is predicted that by 2025 as many as 29% of adults worldwide will be affected by hypertension [1]. Hypertension has resulted in the death of around 8 million people each year, of which 1.5 million deaths occur in Southeast Asia, where 1/3 of the population suffers from hypertension, which can lead to an increase in the burden of health costs [2]. According to the American Heart Association, the American population aged over 20 years suffer from hypertension has reached up to 74.5 million people, but almost 90–95% of cases have no known cause [3]. Hypertension is a silent killer where the symptoms can vary for each individual and are almost the same as the symptoms of other diseases. The symptoms are headache/feeling of heaviness in the neck, dizziness (vertigo), heart palpitations, fatigue, blurred vision, ringing in the ears (tinnitus), and nosebleeds [4].

Based on the results of blood pressure measurements, the prevalence of hypertension in the population aged 18 years and over in 2018 in Indonesia was 31.7%. By province, the highest prevalence of hypertension is in South Kalimantan (39.6%) and the lowest is in West Papua (20.1%). Meanwhile, when compared to 2013 there was a decrease of 5.9% (from 31.7% to 25.8%). This decrease can occur due to various factors, such as different blood pressure measuring devices, people who have started to become aware of the dangers of hypertension. The highest prevalence is in Bangka Belitung Province (30.9%), and the lowest in Papua (16.8%) [5]. The prevalence of hypertension in Indonesia obtained through a questionnaire diagnosed by health workers was 9.4%, those diagnosed by health workers or were taking medication were 9.5%. Hence, there is 0.1% who takes their own medicine [6]. Based on gender, the prevalence of hypertension in 2007 and 2013 was higher for women than for men. In 2007 men (31.3%) and women (31.9%) while in 2013 men (22.8%) and women (28.8%) [7].

According to the *Indonesia Basic Health Research* 2018, the prevalence of hypertension was 34.1%. This figure has increased quite high compared to the 2013 Riskesdas results which stated the incidence of hypertension based on the results of blood pressure measurements in Indonesian people aged 18 years and over was 25.8%. West Sumatra Health Office data for 2018, shows that the incidence of hypertension according to total coverage is in the province of West Sumatra, Payakumbuh City (57.8%), Solok Regency

(33.08%), Dhamasraya Regency (29.76%), Mentawai Islands Regency (28.24%), Pesisir Selatan Regency (26.41%), Sawahlunto City (18.19%), Tanah Datar Regency (18.09%), Fifty Cities Regency (17.44%), Sijunjung Regency and Agam Regency (17.36%), Padang Panjang City (15.82%), Pariaman City (10.79%), Pasaman Regency (9.94%), West Pasaman Regency (7.38%), Padang City (7.36%), City of Solok (7.07%), Regency of Padang Pariaman (6.73%), City of Bukittinggi (4.06%), and Solok Selatan (1.77%) [8].

Factors that cause high blood pressure consist of factors that cannot be changed and those that can be changed. Factors that cannot be changed include age, gender, and genetic factors. Factors that can be changed include physical activity, fat consumption, nutritional status, sodium/salt consumption, smoking habits, alcohol consumption habits, and stress [9]. Based on the background above, the hypothesis of this study is that there is an influence of factors that can be changed and cannot be changed with the incidence of hypertension, while the purpose of this study is to look at the factors that can be changed and cannot be changed that most influence the incidence of hypertension at Arosuka Hospital, Solok Regency.

Methods

This type of research is descriptive analytic with cross-sectional approach. This research was conducted at Arosuka Hospital, Solok Regency by taking secondary data about the incidence of hypertension. The population and sample of the study were all visits of hypertensive patients to Arosuka Hospital in the 2016–2020 period. Researchers used criteria in collecting secondary data, the main of which was the completeness of data from medical records, patients who were treated at Aro Suka Hospital in the 2016–2020 range. The data collection process was assisted by medical record officers with a computerized system to reduce selection bias when selecting research samples. as well as to reduce information bias in the data collection process. Data analysis by Chi-square test and Binary Logistic Regression test using a computer program and to analyze confounding by analyzing changes in the value of the coefficient β which is more than 10% is identified as confounding. The instrument used in this study was an observation sheet by collecting data on hypertension patients so that the data was easily processed based on secondary data from the Medical Records of Arosuka Hospital, Solok Regency, West Sumatra.

Data analysis in a study usually goes through a stepwise procedure, namely univariate data analysis is done by looking at the frequency of occurrence in the form of a percentage or proportion of each variable, and then the analysis is carried out to see the relationship between the two variables that are suspected to have a relationship or correlation. In this study the Chi-square test was used to see the relationship and the strength of the relationship between the two variables at a significant level of relationship at the 95% degree of confidence. Lastly is the analysis to look for the influence of these variables on an object simultaneously or simultaneously. The statistical test used in this research is the Binary Logistic Regression Test used to see the effect of the two variables.

Results

Data were collected through the medical records of hypertension patients at Arosuka Hospital, Solok Regency, there were 133 patients with Stage I hypertension and Stage II hypertension. The results of the 2021 survey showed 75 samples of Stage II hypertension patients, while 58 samples of Stage I hypertension patients. Age of hypertensive patients, with the age of the elderly as many as 88 samples while the age of adults, the data is shown in Table 1.

Based on the results of the study, it was found that out of 133 respondents, there were 75 samples (56.4%) with Stage II hypertension and 58 samples (43.6%) with Stage I hypertension. For the age variable, there were 88 (66.2%) elderly. In the gender variable, there were 85 samples (63.9%) women. The body mass index (BMI) variable was more than half overweight by 92 (69.2%). The exercise variable is almost half of those who don't do regular exercise every week as many as 77 (57.9%). Smoking habits are more than half of the respondents 85 (63.9%) do not smoke. Lastly is heart disease, where most of the respondents did not experience heart disease 116 (87.2%).

From Table 2, the variable most at risk for the occurrence of hypertension is the BMI variable where

Table 1: Baseline data prevalence of hypertension

Variable	Frequencies	Percentage
Hypertension history		
Hypertension stage II	75	56.4
Hypertension stage I	58	43.6
Age		
Further elderly	88	66.2
Early elderly	45	33.8
Gender		
Female	85	63.9
Male	48	36.1
Body mass index		
Overweight	92	69.2
None overweight	41	30.8
Physical exercise		
Not a routine	77	57.9
Routine	56	42.1
Smoking		
Yes	48	36.1
No	85	63.9
Heart disease		
Yes	17	12.8
No	116	87.2
Total	133	100

it is known that out of 92 samples of BMI overweight there were 62 samples (82.7%) in Stage II hypertension and 41 samples of BMI not overweight there were 13 samples (17.3%) in Stage II hypertension. Based on statistical tests, it was found that p = (0.0001) < α (0.05), means that there is a relationship between BMI and hypertension. The result of OR = 4.451 means that an overweight BMI sample has a 4 times greater chance of developing hypertension than a BMI sample that is not overweight. The variable most at risk for developing hypertension is heart disease. It is known that out of 17 samples diagnosed with heart disease, there were 15 samples (20%) in Stage II hypertension and 116 samples not diagnosed with heart disease, 60 samples (80%) were in Stage II hypertension. The statistical test obtained p = (0.010) < α (0.05), meaning that there is a relationship between heart disease and hypertension. The result of OR = 7,000 means that samples diagnosed with heart disease have a 7 times greater chance of developing hypertension than samples without a diagnosis of heart disease.

Based on the statistical test results in Table 3, the regression equation is as follows: $Y = \beta_0 + \beta_i X_1 + \beta_i X_2 + + \beta_n X_n$ = Y (Hypertension) = −2.207 − 2.170X1 (age) + 1.007X2 (BMI) + 2.504X3 (Heart disease). Constant value in the equation above, namely, −2.207 and a negative value indicating the negative effect of the independent variable. The regression coefficient for age (X1 age) is negative 2.170 meaning that if age increases (X1 age), the incidence of hypertension will increase by 2.170 or 2 times. The coefficient of BMI (X2IMT) is positive 1.007, meaning that if the BMI is normal (X2IMT), the incidence of hypertension will decrease by 1.007 or 1 time [10]. The coefficient of heart disease (X3 heart disease) is positive 2.504 meaning that if heart disease is not diagnosed (X3) then the incidence of hypertension will decrease by 2.504 or 2 times. Based on the significance value, the most influential variable is heart disease (0.002 < 0.05) with a value of β = 12.231 or at risk of 12 times.

The coefficient of heart disease (X3 heart disease) is positive 2.504 meaning that if heart

Table 2: Bivariate analysis of hypetension

Variable	Hypertension						p-value	OR (95% CI)
	Stage I		Stage II		Total			
	n	%	n	%	n	%		
Age								
Further elderly	36	48.0	52	89.7	88	66.2	0.0001	0.107
Early elderly	39	52.0	6	10.3	45	33.8		
Gender								
Female	58	77.3	27	46.6	85	63.9	0.0001	3.917
Male	17	22.7	31	53.4	48	36.1		
Body mass index								
Overweight	62	82.7	30	51.7	92	69.2	0.0001	4.451
Not overweight	13	17.3	28	48.3	41	30.8		
Physical activity								
Not a routine	50	66.7	27	46.6	77	57.9	0.020	2.296
Routine	25	33.3	31	53.4	56	42.1		
Smoke								
Yes	17	22.7	31	53.4	48	36.1	0.0001	0.255
No	58	77.3	27	46.6	85	63.6		
Heart diseases								
Yes	15	20.0	2	3.4	17	12.8	0.010	7.000
No	60	80.0	56	96.6	116	87.2		
Total	75	100	58	100	133	100		

Table 3: Multivariate analysis

Variable	B	SE	Wald	Df	Sig	Exp (β)	95% CI for Exp (β)	
							Lower	Upper
Modifiable								
Physical activity	0.529	0.447	1.397	1	0.237	1.697	0.706	4.078
Body mass index	1.007	0.469	4.612	1	0.032	2.737	1.092	6.862
Heart diseases	2.504	0.820	9.319	1	0.002	12.231	2.450	61.045
Unmodifiable								
Gender	0.539	0.471	1.310	1	0.252	1.714	0.681	4.313
Age	−2.170	0.521	17.368	1	0.000	0.114	0.041	0.317
Constant	−2.207	0.819	7.264	1	0.007	0.110		

disease is not diagnosed (X3) then the incidence of hypertension will decrease by 2.504 or 2 times. Based on the significance value, the most influential variable is heart disease (0.002 < 0.05) with a value of β = 12.231 or at risk of 12 times. Blood pressure that continues to increase in the long term will cause plaque to form which can narrow the coronary arteries [11]. Coronary blood vessels are oxygen and nutrient (energy) pathways for the heart [12]. Under certain conditions, high blood pressure can crack plaque in the coronary arteries [13]. The loose fragments can clog the blood flow causing heart disease [14]. When you have hypertension, your blood vessels thicken from the pressure of forcefully flowing blood; this can cause your blood vessels to stiffen, making your heart work harder to keep pumping blood [5]. The thicker and narrower blood vessels associated with high blood pressure make it easier for plaque to build up on the artery walls. If the accumulation of plaque in the arteries leads to the heart it will cause coronary artery disease, leading to a heart attack or heart failure.

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Conclusion

Based on the results of the bivariate modifiable variable test analysis, BMI, exercise, smoking and heart disease with the Chi-square test on the incidence of hypertension in Arosuka Hospital, Solok Regency. It can be seen that all modifiable variables show a relationship with the incidence of hypertension. The results of the multivariate analysis of unmodifiable and modifiable variables with the incidence of hypertension

with the binary logistic regression test showed that three influential variables were age, BMI and heart disease with hypertension. Based on the results obtained, it is expected that hypertensive patients maintain their health, especially in maintaining heart health because the heart is very at risk of 12 times. Efforts to maintain heart health include light exercise regularly and maintaining a healthy diet.

Acknowledgments

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