

The Comparison Study of Blood Pressure in Smokers and Nonsmokers Hypertension Patients of UPT Puskesmas II Sumbang Working Area

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Abstract---Background: Smoking plays a role in hypertension. Smoking consumption in Indonesia was the highest among ASEAN countries in 2017. It is estimated that new smokers aged 19 and under are about 16.4 million. Increased blood pressure is influenced by several factors, one of the factors is smoking. Blood pressure differences occur since cigarettes contain nicotine and monoxide sucked into the bloodstream, damaging the endothelium arteries, lead the process of atherosclerosis and high blood pressure. **Objective:** To find out the comparison of the blood pressure between the smokers and non-smokers hypertension patients. **Methods:** The method of this research was a descriptive comparative study. A digital sphygmomanometer and master table are used as the research instruments. The sample was obtained by using total sampling with sample size of 64 respondents. The data were analyzed by the independent sample t-test. The results of this study showed that the difference between the systolic blood pressure mean in smokers and nonsmokers hypertension patients was 18.0807 ± 12.96145 mmHg. The difference of the diastolic blood pressure mean in smokers and non-smokers hypertension patients was 9.0669 ± 4.55327 mmHg ($p = 0.045 < 0.05$ and $0.014 < 0.05$). **Conclusion:** There was a difference in blood pressure between the smokers and non smokers hypertension patients in UPT Puskesmas II Sumbang working area (p -value < 0.05).

Keywords: *blood pressure, hypertension, smokers, nonsmokers*

I. INTRODUCTION

British Hypertension Society stated hypertension is systolic blood pressure at rest at or above 140 mmHg systolic and/or diastolic 90 mmHg. These criteria can be changed with the increase in blood pressure due to increasing age, and its level varies in each population. The risk of cardiovascular disease increases with an increase in blood pressure within normal limits although [1].

The latest statistical data states that as many as 1 billion people worldwide, or one out of four adults suffer from hypertension. The estimated number of people with hypertension will increase to 1.6 billion by 2025. A total of 24.7% of the population of Southeast Asia and 23.3% of Indonesia's population aged 18 years and above have hypertension by 2014. The prevalence of people with high

blood pressure nationwide by 30.9%. The prevalence of high blood pressure in women (32.9%) was higher than men (28.7%). The prevalence was slightly higher in urban areas (31.7%) than in rural areas (30.2%). The prevalence increasing with increasing age [2].

Based on data from the Central Java Provincial Health Office 2016 obtained data of the population at risk (> 18 years) whose blood pressure measurements were taken in 2016, there were 5,292,052 or 20.16%. From the measurement of blood pressure, as many as 611 358 people or 11.55% expressed hypertension / high blood pressure and the incidence of hypertension in the percentage of 26.15%. This condition makes the hypertension patients in Banyumas district to be the 6th largest in Central Java province. Based on data from the Health Profile of Banyumas in 2015 from 40 254 the incidences of hypertension in Banyumas, this district ranks the second of the donating districts with hypertensive by 4810 inhabitants with the District of North Purwokerto as the first rank [3].

The risk factors that lead to hypertension is divided into two factors, the factors that cannot be controlled and those that can be controlled. Factors that cannot be controlled include age, gender, and heredity (genetics). Factors that can be controlled include obesity (obesity), dyslipidemia, stress, excessive alcohol consumption, excessive salt intake, physical activity, unbalanced diet and smoking [4].

Substances toxic chemicals in cigarettes can lead to high blood pressure or hypertension. One of these toxic substances is nicotine, where nicotine can increase the adrenaline which makes the heart beat faster and work harder, increasing heart rate and heart contraction, and increased in blood pressure [5].

The World Health Organization (WHO) says smoking kills more than five million people per year and is projected to kill ten million by 2020. Based on data from the National Health Indicators Survey (Survei Indikator Kesehatan Nasional) in 2016, the national smoking prevalence was 28.5%. The prevalence of smoking by gender prevalence in men 59% and women 1.6%. By residence, smoking prevalence in rural and urban areas is not too much different,

however, it is slightly higher in rural areas (29.1%) compared to urban areas (27.9%) [1].

Results of a preliminary study conducted by researchers in September 2018 in UPT Puskesmas II Sumbang citizen showed that 58 patients of UPT Puskesmas II Sumbang were suffering from hypertension in August 2018. In addition, in July 2018 there were 78 patients with hypertension and in June it decreased to 63 patients, so that the total number of people with hypertension in June - August 2018 was 199 patients.

Based on the background of the study, researchers interested in conducting further research on the difference between blood pressure in smokers and nonsmokers' hypertensive patients.

II. METHOD

This research is a comparative descriptive. The population in this study were people who had hypertension in the region of UPT Puskesmas II Sumbang by the number of 64 patients. The samples in studies were taken using total sampling, so the sample size in this study was 64 respondents. Data were collected from 24 April 2019 until June 26th, 2019. The research instrument used were the digital sphygmomanometer brand omron, master table for writing the results of measurements of blood pressure, smoking habits questionnaire and Standard Operating Procedure (SOP) for blood pressure measurement. Data were analyzed by univariate analysis using the central tendency mean and standard deviation. The bivariate analysis used in this study was an independent sample t-test.

III. RESULTS AND DISCUSSION

This study obtained the following results:

TABLE 1. CHARACTERISTICS OF RESPONDENTS FREQUENCY DISTRIBUTION BY SEX, AGE AND CIGARETTE CONSUMPTION UNIT IN UPT PUSKESMAS II SUMBANG WORKING AREA

Characteristics of Respondents	Frequency	Percentage (%)	
Patients with Hypertension	Smokers	11	17,2
	Non-Smokers	53	82,8
	Total	64	100,0
Gender	Male	16	25,0
	Female	48	75,0
	Total	64	100,0
Age	≤60 years	42	65,6
	> 60 years	22	34,4
	Total	64	100,0

Almost all respondents are nonsmokers with a difference of 65.6% of all respondents, and also most of the respondents were female (75%). At the age column, it was found that most respondents was ≤60 years (65.6%).

TABLE 2. FREQUENCY DISTRIBUTION OF SYSTOLIC BLOOD PRESSURE IN PATIENTS WITH HYPERTENSION SMOKERS NON-SMOKERS IN UPT PUSKESMAS II SUMBANG WORKING AREA

Systolic Blood Pressure	Smokers	Non-Smokers
Mean	151,8182	133,7358
Std. Deviation	25,92612	12,96467

Table 2 shows that the mean and standard deviation of systolic blood pressure in hypertensive smokers is higher than nonsmokers' respondents by a margin of ± 12.96145 18.0807 mmHg.

TABLE 3. FREQUENCY DISTRIBUTION OF DIASTOLIC BLOOD PRESSURE IN PATIENTS WITH HYPERTENSION SMOKERS NON-SMOKERS IN UPT PUSKESMAS II SUMBANG WORKING AREA

Diastolic Blood Pressure	Smokers	Non-Smokers
Mean	86,7273	77,6604
Std. Deviation	14,51269	9,95942

Table 3 shows that the mean and standard deviation of diastolic blood pressure in hypertensive smokers is higher than nonsmokers' respondents by a margin of 9.0669 ± 4.55327 mmHg.

The latest research says that be one of risk factors for hypertension, smoking can be prevented. Smoking is a risk factor with the potential to be eliminated to fight the current increase hypertension and cardiovascular disease in general in Indonesia.

Smoking increases blood pressure through the mechanism of norepinephrine from nerve endings which are stimulated by nicotine adrenergic. The risk of smoking is related to the number of cigarettes smoked per day, depending on the length of smoking [5].

The results were consistent with research conducted by Setyanda [6] that obtained mean of systolic blood pressure of people with hypertension grade I (147.75 mmHg) was higher than the mean of systolic blood pressure of normotensive respondents (115.09 mmHg). The mean of diastolic blood pressure of hypertensive patients grade I (87.5 mmHg) was higher than the mean diastolic blood pressure of normotensive respondents (76.09 mmHg).

It was assumed that [7] smoking can cause an increase on the heart rate and oxygen needed to be supplied to the heart. For patients who have atherosclerosis, or the buildup of fat in blood vessels, smoking can aggravate hypertension and potentially in other degenerative diseases such as stroke and heart disease.

The mean of systolic and diastolic pressure of this study were inconsistent compared to the results of research conducted by Farabi [8] to the students of SMK N 1 Padang. The mean systolic blood pressure of light smoker students (111.28 mmHg) is lower than the mean systolic blood pressure of non-smoker students (113.38 mmHg). The mean diastolic blood pressure of students with light smokers was 68.26 mmHg. It was lower than the mean diastolic blood pressure of non-smoker students (71.18 mmHg). Researchers assumed that it occurred because this study only measured blood pressure in adolescents. Blood pressure in adolescents is still during the rebound phenomenon. The rebound phenomenon and the process of adaptation is the reason that blood pressure of smokers is lower than smokers. Nicotine, a content of cigarettes, can trigger the release of nitric oxide synthase (NOS), which helps the performance of baroreceptors to maintain blood pressure primarily through the activities of negative feedback. Inhalation of carbon

monoxide (CO), one of the contents of cigarette smoke, in low numbers (≤ 250 ppm) can trigger blood vessel relaxation effects. CO also acts as inhibitors of vasoconstriction after blockade of NO [8].

TABLE 4 .DIFFERENCE MEASUREMENT RESULTS OF SYSTOLIC AND DIASTOLIC BLOOD PRESSURE IN PATIENTS WITH HYPERTENSION SMOKERS AND NON-SMOKERS IN UPT PUSKESMAS II SUMBANG WORKING AREA

	Hypertension Patients	N	Mean Difference (IK95%)	p-value
Systolic Blood Pressure	Smokers	11	18,08233 (0,44788 - 35,71678)	0,045
	Non-Smokers	53		
	Total	64		
Diastolic Blood Pressure	Smokers	11	9,06690 (1,89793 - 16,23586)	0,014
	Non-Smokers	53		
	Total	64		

Table 4 shows the results of statistical tests of Independent Sample T – Test. It shows that H_0 is rejected, and H_a is accepted. It means that there were differences in systolic blood pressure and diastolic in hypertensive patients smokers and nonsmokers in the region of UPT Puskesmas II Sumbang, Banyumas with p value respectively, $p = 0.045 < 0.05$ and $p = 0.014 < 0.05$.

This difference occurred because the cigarettes contain harmful chemical substances such as nicotine and carbon monoxide. The substance will be inhaled through the cigarette that gets into the bloodstream and causes damage to the endothelial lining of the arteries, as well as accelerated atherosclerosis. This is what can increase blood pressure in hypertensive smoker patients. As it has already explained that blood pressure is influenced by the volume and elasticity of blood vessels and the blood vessels of smokers have two substances (carbon monoxide and nicotine) causing the damage to the elasticity of blood vessels. It causes the difference between blood pressure in smokers and nonsmokers. During the study, the researchers also found that some nonsmoker hypertensive respondents have ever had the habit of smoking before, but they had stopped smoking with the time of quitting smoking varied from three months ago to 20 years ago.

Toxic chemicals in cigarettes can lead to high blood pressure or hypertension. One of these toxic substances is nicotine, where slight nicotine intake causes mild hypertension. Nicotine can increase adrenaline which makes the heart beat faster and work harder, increasing heart rate and heart contraction, and increasing blood pressure [5].

The mechanisms underlying the correlation of cigarettes with blood pressure is an inflammatory process, neither exsmokers nor current smokers showed an increase in the number of C-reactive protein, including the nature of the inflammatory protein, resulting in the inflammatory process endothelium, resulting in dysfunction of the endothelial cells of blood vessel damage, and stiffness in the artery walls that leads to an increase in peripheral vascular resistance.

The natural inflammatory agents have a very strong correlation with the onset of hypertension. The results showed that the inflammatory agents in patients with

hypertension is much higher than those who are current or former smokers. All three of these substances will cause the damage to the vascular endothelium which is the risk of hypertension and cardiovascular disease.

The pathogenesis of high blood pressure disorders starting from blood pressure is influenced by cardiac output and peripheral resistance and the right atrial pressure. In the early stages, most patients with hypertension showed cardiac output increases and then followed by a rise in peripheral resistance which results in increased blood pressure persist. Increased peripheral resistance in essential hypertension occurs gradually over a long time while the autoregulation process occurs in a short time [9].

Smoking is one of the causes of hypertension. Cigarettes smoked can lead to increased blood pressure. After smoking at least 2 stalks the systolic and diastolic pressure will increase to 10 mmHg. Blood pressure will remain at that height until 30 minutes after quitting smoking a cigarette. When the effects of nicotine slowly disappear, blood pressure will decrease slowly. However, in heavy smokers, blood pressure will be at a high level throughout the day [10].

The length of smoking term is calculated from the first time someone smoke until the time of measurement. The length of a person smoking will have an impact on exposure to harmful chemical substances contained in cigarettes. Some of them are tar, nicotine, and carbon monoxide. They will increase the systolic pressure to 10-25 mmHg and increase heart rate to 5-20 times per minute. This results supported the theory mentioned by Suradi and Tisa [11] that one of the factors that can increase the risk of increased blood pressure which is the average number of cigarettes smoked per day, the type of cigarettes smoked, how to smoke cigarettes and old smoking within 10 years. So, the more the number of cigarettes smoked and the longer the period being a smoker, the greater the risk can increase blood pressure.

According to research conducted by Naldi [12], the difference of blood pressure in smokers and nonsmokers after futsal showed that of 40 respondents surveyed had no difference in systolic blood pressure (p-value 0.004 < 0.05) and diastolic (p-value 0.002 < 0.05). Another research [6] on the correlation of smoking with hypertension in men aged 35-65 years in the city of Padang proved that of 92 respondents surveyed had no correlation between smoking and hypertension ($p = 0.003$).

IV. CONCLUSIONS

1. There are differences between systolic and diastolic blood pressure of hypertensive smoker patients and nonsmokers in the working area of UPT Puskesmas II Sumbang, Banyumas with p-value < 0.05 .
2. An overview of the characteristics shows that nonsmoker respondents (82.8%) was more than smoker respondents (17.2%) with a difference of 42 respondents (65.6%). Table 4.1 also shows that most of the respondents were female (75%) who had higher blood pressure than male respondents (25%) with a difference of 32 respondents (50%). At the age table, it was found that the respondents

aged ≤ 60 years (65.6%) were higher than respondents aged > 60 years (34.4%) with a difference of 20 respondents (31.2%).

3. The mean and standard deviation of systolic blood pressure in hypertensive smoker patients ($\pm 151.8182 \pm 25.92612$ mmHg) were higher than the systolic blood pressure in hypertensive nonsmokers' patients ($\pm 133.7358 \pm 12.96467$), with a difference of 18, 12.96145 ± 0.807 mmHg.
4. The mean and standard deviation of the diastolic blood pressure in hypertensive smoker patients (86.7273 ± 14.51269 mmHg) were higher than the diastolic blood pressure in hypertensive non-smoker patients (77.6604 ± 9.95942), with a difference of 9, 0.669 ± 4.55327 mmHg.

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