

Determinants of Essential Hypertension among Young Adults in Suburban and Urban Areas in Semarang City, Indonesia

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Abstract—Essential hypertension was the most common non-communicable disease in Semarang City, Indonesia. There is a tendency for the increasing prevalence of hypertension among people living in urban areas compared to suburban/ rural areas. Essential hypertension is no longer as a disease of the elderly, but has also become a disease of middle-aged adults This study aimed to determine the determinants of essential hypertension among young adults in suburban and urban areas in Semarang City, Indonesia. This study was a case control with 139 cases and 139 controls selected by simple random sampling. The instruments of this study were structured questionnaires, IPAQ (International Physical Activity Questionnaire), Holmes scale, and food frequency. Chi-square tests was done. The variables that are statistically significant with essential hypertension among young adults in suburban and urban areas are sex (OR: 2.6; 95% CI: 1.53-4.42), obesity (OR: 2.9; 95% CI: 1.71-4.92), smoking habits (OR: 2.29; 95% CI: 1.19-4.48), physical activity (OR: 2.06; 95% CI: 1.23-3.45), salt consumption (OR: 2.41; 95% CI: 1.37-4.27), and stress (OR: 3.22; 95% CI: 1.69-6.29).

Keywords— *essential hypertension, determinants, young adult*

I. INTRODUCTION

Non-communicable diseases (NCDs) are currently a very important concern in the public health sector because they cause high rates of morbidity and mortality. Based on the Global Status Report on Non-communicable Disease [1], there was 68% of deaths in the world are caused by non-communicable diseases, such as cardiovascular disease, cancer, respiratory disease and diabetes, 42% of them caused premature death before the age of 70 and 82% of them occurred in low-and-middle income countries. Some developing countries including in the Southeast Asia region experience double burden, with the existence of infectious diseases but NCD cases are increasing [2]. One of the countries experiencing this double burden is Indonesia.

Prevalence of hypertension in Indonesia has increased from 2013 by 25.8% to 34.1% in 2018. According to the area, prevalence of hypertension in urban areas (34.4%) was not significantly different from rural areas (33.7%). The national

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report showed there were 8 provinces with the prevalence above nationals. Central Java Province ranked 4th with the highest prevalence of hypertension nationally with 37.6% [3]. Most people with hypertension in Indonesia are not detected, while those who are detected are generally unaware of disease condition. Even though hypertension is a major cause of heart, brain, nerve, liver damage and kidney disease, it requires high cost of treatment [4].

Essential hypertension is a disease that is not determined by just one factor, but it is determined by several factors that play a role in increasing blood pressure. Some risk factors for essential hypertension are obesity, dyslipidemia, high sodium intake, lifestyle (smoking habits and alcohol consumption), stress/ emotional factors, age, sex, and lack of potassium intake [5]. Apart from these factors, genetics/ family history also has an important role in the incidence of essential hypertension [6].

The aging process in middle and lower income countries, including Indonesia, will increase the number of deaths from major non-communicable diseases for the next 25 years [2]. There is a tendency for the increasing prevalence of hypertension among people living in urban areas compared to suburban/ rural areas, at 14.2% [3].

Essential hypertension is no longer as a disease of the elderly, but has also become a disease of middle-aged adults and children [7]. Essential hypertension generally starts at a young age, around 5-10% occurs at the age of 20-30 years. This study aimed to know the determinants of essential hypertension among young adults in suburban and urban areas in Semarang City, Indonesia by sex, family history, obesity, alcohol consumption, smoking habits, physical activity, salt consumption, and stress.

II. MATERIALS AND METHODS

This study was a case control with 139 cases and 139 controls selected by simple random sampling. Cases were defined as patients aged 40-60 years old with essential hypertension (SBP \geq 140 mmHg; DBP \geq 90 mmHg) and

recorded in primary healthcare center in Semarang City, Indonesia. Controls were patients aged 40-60 years old without essential hypertension and recorded in primary healthcare center in Semarang City, Indonesia. The instruments of this study were structured questionnaires to measure sex, family history, obesity, alcohol consumption, and smoking habits variables., IPAQ (International Physical Activity Questionnaire) to measure physical activity, food frequency to measure salt consumption, and Holmes scale to measure stress. Data were analyzed by Chi Square test.

III. RESULTS AND DISCUSSION

Based on characteristics of age, sex, and education, the majority of respondents, both cases and controls were in the age range of 40-50 years. On the sex characteristics, most of case respondents were female (71.9%), but in the control group, male respondents (50.3%) were not significantly different from female respondents (49.7%). On the education characteristics, both cases and controls were mostly educated from junior high school (cases: 62.6%; controls 41%).

Table I shows statistical tests performed on sex, family history, obesity, alcohol consumption, smoking habits, physical activity, salt consumption, and stress with essential hypertension. Variables that are statistically significant with essential hypertension are sex (OR: 2.6; 95% CI: 1.53-4.42), obesity (OR: 2.9; 95% CI: 1.71-4.92), smoking habits (OR: 2.29; 95% CI: 1.19-4.48), physical activity (OR: 2.06; 95% CI: 1.23-3.45), salt consumption (OR: 2.41; 95% CI: 1.37-4.27), and stress (OR: 3.22; 95% CI: 1.69-6.29).

Hypertension is a condition of an increase in blood pressure which gives a continuous symptom to a target organ of the body resulting in more severe damage such as stroke (occurs in the brain and has an impact on high mortality), coronary heart disease (occurs in damage to heart blood vessels) and left ventricular constriction (occurs in the heart muscle). Besides these diseases, it can also cause kidney failure, other vascular diseases, diabetes mellitus and others [5].

The emergence of hypertension, not only caused by high blood pressure, but also because of other risk factors such as genetics, complications of the disease, and abnormalities in the target organs; heart, brain, kidneys, and blood vessels. Hypertension often arises with other risk factors that arise as metabolic syndrome, called hypertension with impaired glucose tolerance or diabetes mellitus (DM), dyslipidemia (high blood cholesterol) and obesity [8].

At an early age there was no difference in blood pressure between male and female. However, during adolescence, males tend to have higher blood pressure than females. This difference is more apparent in young and middle-aged adults. In fact, it will turn around in old age [9]. This is caused by the estrogen hormone which can protect women from cardiovascular disease. It's level will decrease after menopause.

Prevalence of hypertension among female (25%) is greater than males (24%) [10]. Apart from being a hormone in female, estrogen also functions as an antioxidant. Low Density Lipoprotein (LDL) is easier to penetrate plaques in the arteries

of blood vessels when oxidized. The role of estrogen as an antioxidant is to prevent the LDL oxidation process, so that the ability of LDL to penetrate the plaque will decrease. Other role of estrogen is as a widener of the heart's blood vessels, so that the blood flow becomes smooth and the heart gets enough oxygen supply [5].

The association between obesity with the increase of blood pressure has been reported by several studies. Body weight and body mass index (BMI) are directly correlated with blood pressure, especially systolic blood pressure. The relative risk of suffering from hypertension in obese people is 5 times higher than that of a normal body. It is 20-30% of people with hypertension have more weight (overweight).

Cigarette consumption is a risk factor that is the second leading cause of death in the world after hypertension. Cigarettes are estimated to cause 71% of lung cancer, 42% of chronic obstructive pulmonary disease (COPD), and 10% of cardiovascular disease. The highest number of female cigarette users is in lower-middle income countries, while the total population is in upper-middle income countries. Cigarette consumption is associated with the incidence of oral cancer, hypertension, heart disease, and other diseases [1].

Physical activity is associated with managing hypertension, because aerobic and regular physical activity can reduce peripheral resistance which will lower blood pressure. Physical activity/ exercise is also associated with the role of obesity in hypertension. Lack of exercise will increase the probability of obesity and if salt intake also increases, it will facilitate the onset of hypertension [11]. Inactive people also tend to have a higher heart rate, so the heart muscle must work harder at each contraction. The harder and often the heart muscle has to pump, the greater the pressure imposed on the arteries [12].

Salt is very important in the mechanism of hypertension. Effect of salt intake on hypertension through increased plasma volume (body fluids) and blood pressure. This situation will be followed by an increase in the excretion of excess salt, so that it returns to a normal hemodynamic state [11]. Hypertension is almost never found among ethnic group with minimal salt intake. Salt intake of less than 3 grams per day causes a low prevalence of hypertension, whereas if the salt intake is between 5-15 grams per day the prevalence of hypertension increases to 15-20% [11].

Not only does it affect blood pressure, the amount of salt consumed also affects all cardiovascular diseases. Someone who consumes salt <5 grams per day can prevent the occurrence of cardiovascular disease. WHO estimates that decreasing the amount of salt consumption from 9-12 grams per day (general habit) to 5 grams per day (WHO recommendations) is the main factor in reducing blood pressure and the risk of cardiovascular disease [1].

Salt reduction at the community level is the WHO-suggested strategy for prevention of CVD in developing countries. WHO has recommended salt reduction in addition to risk modification by advocating multiple-drug treatments using, for example, anti-hypertensive, oral hypoglycemic agents and lipid-lowering medications [1].

TABLE I. BIVARIAT STATISTICAL TEST RESULT

Variable	Cases		Controls		Total		OR	95% CI	P-value
	n	%	n	%	n	%			
Sex									
1. Female	100	35.9	69	24.8	169	60.8	2.60	1.53-4.42	<0,01*
2. Male	39	14.1	70	25.2	109	39.2			
Total	139	50.0	139	50.0	278	100			
Family history							1.46	0.88-2.4	0.12
1. Yes	74	26.6	61	21.9	135	48.6			
2. No	65	23.4	78	28.1	143	51.4			
Total	139	50.0	139	50.0	278	100.0			
Obesity							2.9	1.71-4.92	<0.01*
1. Yes	99	35.6	64	23.1	163	58.6			
2. No	40	14.4	75	26.9	115	41.4			
Total	139	50.0	139	50.0	278	100,0			
Alcohol consumption							1.42	0.38-5.82	0.77
1. Yes	7	2.50	5	1.8	12	4.3			
2. No	132	47.5	134	48.2	266	95.7			
Total	139	50.0	139	50.0	278	100.0			
Smoking habits (a)							1.23	0.62-2.46	0.52
1. Ex-smoker	25	8.9	21	7.5	46	16.5			
2. Non-smoker	114	41.1	118	42.5	232	83.5			
Total	139	50.0	139	50.0	278	100.0			
Smoking habits (b)							2.29	1.19-4.48	<0.01*
1. Smoker	37	13.3	19	6.8	56	20.1			
2. Non-smoker	102	36.7	120	43.2	222	79.9			
Total	139	50.0	139	50.0	278	100.0			
Physical activity (a)							1.13	0.68-1.88	0.62
1. Moderate	56	20.1	52	18.7	108	38.9			
2. High	83	29.9	87	31.3	170	61.1			
Total	139	50.0	139	50.0	278	100.0			
Physical activity (b)							2.06	1.23-3.45	<0.01*
1. Low	69	24.8	45	16.2	114	41.1			
2. High	70	25.2	94	33.8	164	58.9			
Total	139	50.0	139	50.0	278	100.0			
Salt consumption							2.41	1.37-4.27	<0.01*
1. High	54	19.4	29	10,4	83	29.9			
2. Normal	85	30.6	110	39,6	195	70.1			
Total	139	50.0	139	50.0	100	100.0			
Stress							3.22	1.69-6.29	<0.01*
1. Yes	45	16.2	18	6.5	63	22.7			
2. No	94	33.8	121	43.5	215	77.3			
Total	139	50.0	139	50.0	278	100.0			

*: statistically significant

Stress will increase peripheral vascular resistance and cardiac output, thereby stimulating sympathetic nerve activity. The association between stress and hypertension through sympathetic nerve activity, which can increase blood pressure gradually. If stress becomes prolonged, it can result in high blood pressure. Stress or mental tension (feeling depressed, moody, confused, anxious, pounding, feeling angry, revenge, fear, guilt) can stimulate the kidneys to release adrenal hormones and stimulate the heart beat faster and stronger, so that blood pressure will increase. If stress lasts long enough, the body tries to make adjustments, resulting in organ abnormalities or pathological changes. According to the Framingham study stated that among female aged 45-64 years, a number of psychosocial factors,

such as stress conditions, marital incompatibility, economic stress, daily stress, work mobility, symptoms of anxiety, and anger-in are associated with the increase of blood pressure and clinical manifestations of all diseases cardiovascular [13].

IV. CONCLUSION

Determinants of essential hypertension among young adults in suburban and urban areas in Semarang City, Indonesia are sex, obesity, smoking habits, physical activity, salt consumption, and stress.

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