East Asian Journal of Multidisciplinary Research (EAJMR)
Vol. 1, No. 9, 2022 : 1855-1870

Stress as the Dominant Factor of Hypertension

Rd. Halim[1], Ledy Uli Vidi Gultom[2], Hendra Dhermawan Sitanggang[3]*
Department of Community Health Sciences, Universitas Jambi
Corresponding Author: Hendra Dhermawan Sitanggang
hendrasitanggang@unja.ac.id

A R T I C L E I N F O

Keywords: Hypertension, Stress, Salt Consumption

Received : 02 October
Revised : 12 October
Accepted: 24 October

A B S T R A C T

Hypertension is one of the non-communicable diseases (NCD) which became a major public health problem both in Indonesia and in the world. Data from the Public Health Office of Jambi showed that hypertension rate was 11.33% in 2019, 3.15% in 2020 and 4.00% in 2021. This study aimed to determine the factors associated with the incidence of hypertension at the Paal Lima Public Health Centre of Jambi City. This study used a cross-sectional design with 214 respondents aged ≥ 18 years old selected through accidental sampling. Data were analysed through chi-square test for bivariate analysis and cox regression for multivariate analysis. The prevalence of hypertension in the study was 33.2%. The multivariate analysis indicated that age (aPR= 2.502; 95% CI: 1.302 to 4.809), salt consumption (aPR= 1.799; 95% CI: 1.086 to 2.978), and stress (aPR= 3.963; 95% CI: 2.355 to 6,670) were correlated with the incidence of hypertension. Age, salt consumption, and stress were the risk factor of the incidence of hypertension. The most dominant factor affecting the incidence of hypertension was stress. Therefore, stress managements are required to reduce stress experienced by people apart from consuming low-sodium food.

DOI: https://10.55927/eajmr.v1i9.1612
ISSN-E: 2828-1519
https://journal.formosapublisher.org/index.php/eajmr/index

INTRODUCTION

Non-communicable diseases (NCDs) caused by lifestyles and degenerative diseases are increasing. Such a trend is triggered by urbanization, modernization, and globalization that drive the change of lifestyle amidst the society (Health Department of RI, 2006). Hypertension is a non-communicable disease that might cause mortality and morbidity. Hypertension is very high blood pressure in blood vessels, namely blood vessels that transport blood from the heart which functions to pump blood to all tissues and organs of the body (Aryantiningsih & Silaen, 2018). If a person's systolic/diastolic blood pressure is more than 140/90 mmHg, then that person has hypertension. Systolic refers to the blood pressure when the heart pumps blood into the arteries (the heart contracts). Diastolic blood pressure is when the heart expands and draws blood back. Symptoms of hypertension sufferers include difficulty of sleeping, shortness of breath, irritability, dizziness, ringing in the ears, dizzy eyes, heavy neck, fatigue, low body temperature and pale face (Sutanto, 2010).

Hypertension is often called the Silent Killer disease. Hypertension can cause various complications such as heart, brain, and kidney disease. It is estimated that global cardiovascular diseases result in 17 million deaths annually. Of these numbers, complications of hypertension cause 9.4 million deaths in the world annually (WHO, 2013). The World Health Organization (WHO) states that along with population growth in 2025, the number of people with hypertension will continue to increase. It is estimated that 29% of the world's population will suffer from hypertension. WHO stated that 40% of hypertension sufferers occurred in developing countries, while 35% lived in developed countries, the African region ranked first with hypertension sufferers by 40%, followed by America by 35%, and the Southeast Asia region by 36%. In Asia, hypertension causes 1.5 million deaths annually. This condition indicates that 1 in 3 people suffer from high blood pressure. Meanwhile in Indonesia, the proportion is very high, reaching 32% of the total population (WHO, 2013).

Based on the Report of the Ministry of Health (2013), hypertension is the third cause of deaths after stroke and tuberculosis in Indonesia, with a proportion of 6.7% of the dead population at all ages. The results of the 2013 Basic Health Research by the Health Research and Development Agency mentioned that the prevalence of hypertension reached 2.5% nationally. It is estimated that there are 15 millions people with hypertension in Indonesia but only 4% of hypertension were able to be controlled. Controlled hypertension refers to people with high blood pressure who realize that they are under treatment. By contrast, 50% of people with hypertension who have no knowledge that they are suffering from hypertension tend to suffer from severe hypertension (Tarigan et al., 2018).

Based on the report of a Basic Health Research (2018: 156-158), a prevalence of 34.1% was acquired from the assessment of the age of ≥ 18 years old, South Borneo has the highest prevalence (44.13%), followed by West Java (39.60%), East Borneo (39.30%), and the lowest acquired by Papua (22.22%). A hypertension prevalence of 8.36% was acquired in Indonesia through the diagnosis of health workers, while a prevalence of 8.84% was acquired for sufferers under treatment. In Jambi Province, the number of people with

hypertension in 2013 through a measurement of the age of ≥18 years old was 24.6% and increased to 28.99% in 2018 (Basic Health Research, 2018). Based on the report of the 2018 Basic Health Research in Jambi Province, the hypertension prevalence on people aged 18 years old and above was 26.28% (Basic Health Research, 2018). The data from the Public Health Office of Jambi in 2021 informed that from 20 Community Health Centres in Jambi City, Paal V Community Health Centre has a hypertension incidence rate of 4.00%, this number increased from last year which only peaked at 3.15% in 2020, 1.91% in 2017, and 2.96% in 2018, but sharply increased to 11.33% in 2019.

Unchangeable factors affecting hypertension are education, gender, occupation, family history, and age. While changeable factors affecting the risk of hypertension are nutritional status, physical activities, alcohol consumption, smoking, salt consumption, and high-fat food consumption (Rusdi, 2009). Bustan (2007) also explained that factors that might cause hypertension include race/tribe, age, urban/rural, obesity, geography, gender, high sodium diet, stress, cigarettes, diabetes mellitus, water composition (sodium, cadmium lead), alcohol, coffee, and contraceptive pills (Bustan, 2007)

One of the causes of hypertension is salt or sodium consumed by people in foods. Salt or sodium absorbed into the blood vessels due to high consumption of salt causes water retention that increases the blood volume. Such a condition causes increased blood pressure. An excessive consumption of sodium will cause natriuretic hormone to get released excessively which indirectly will increase blood pressure (Widanti, 2013). Stress and blood pressure are estimated to occur through sympathetic neural activities, which gradually will increase blood pressure (Afiah et al., 2018). Physical activity is a habit that brings many benefits, such as decreasing body weight, decreasing blood pressure, decreasing the cholesterol level, and decreasing the risk of heart diseases. For high blood pressure, physical activities might reduce the stiffness of blood vessels and improve the endurance of heart and lungs, thus, reducing blood pressure (Widyanto & Triwibowo, 2013). The increased blood pressure on smokers is caused by the smoking habit that becomes the daily life necessity. Smoking might cause hazardous substances to accumulate in blood and might result in various diseases, one of which is cardiovascular disease because nicotine that enters the bloodstream can damage the lining of the artery walls and cause atherosclerosis and high blood pressure (Firmansyah & Rustam, 2017). Hypertension is correlated with stress, age, and obesity (Sumajow et al., 2020). Hypertension is correlated with salt consumption, acquired from the results of the higher proportion of hypertension occurred on people with high salt consumption compared to those with low salt consumption (Purwono et al., 2020).

Due to the high number of cases in Jambi City especially in the working area of Paal V Public Health Centre, it is necessary to find the "Factors Affecting the Incidence of Hypertension in the Working Area of Paal V Public Health Centre of Jambi City in 2021".

THEORETICAL REVIEW

Hypertension is often called the Silent Killer disease. Hypertension can cause various complications such as heart, brain, and kidney disease. It is estimated that global cardiovascular diseases result in 17 million deaths annually. Of these numbers, complications of hypertension cause 9.4 million deaths in the world annually (WHO, 2013). The World Health Organization (WHO) states that along with population growth in 2025, the number of people with hypertension will continue to increase. It is estimated that 29% of the world's population will suffer from hypertension. WHO stated that 40% of hypertension sufferers occurred in developing countries, while 35% lived in developed countries, the African region ranked first with hypertension sufferers by 40%, followed by America by 35%, and the Southeast Asia region by 36%. In Asia, hypertension causes 1.5 million deaths annually. This condition indicates that 1 in 3 people suffer from high blood pressure. Meanwhile in Indonesia, the proportion is very high, reaching 32% of the total population (WHO, 2013).

Based on the Report of the Ministry of Health (2013), hypertension is the third cause of deaths after stroke and tuberculosis in Indonesia, with a proportion of 6.7% of the dead population at all ages. The results of the 2013 Basic Health Research by the Health Research and Development Agency mentioned that the prevalence of hypertension reached 2.5% nationally. It is estimated that there are 15 millions people with hypertension in Indonesia but only 4% of hypertension were able to be controlled. Controlled hypertension refers to people with high blood pressure who realize that they are under treatment. By contrast, 50% of people with hypertension who have no knowledge that they are suffering from hypertension tend to suffer from severe hypertension (Tarigan et al., 2018).

Based on the report of a Basic Health Research (2018: 156-158), a prevalence of 34.1% was acquired from the assessment of the age of ≥ 18 years old, South Borneo has the highest prevalence (44.13%), followed by West Java (39.60%), East Borneo (39.30%), and the lowest acquired by Papua (22.22%). A hypertension prevalence of 8.36% was acquired in Indonesia through the diagnosis of health workers, while a prevalence of 8.84% was acquired for sufferers under treatment. In Jambi Province, the number of people with hypertension in 2013 through a measurement of the age of ≥18 years old was 24.6% and increased to 28.99% in 2018 (Basic Health Research, 2018). Based on the report of the 2018 Basic Health Research in Jambi Province, the hypertension prevalence on people aged 18 years old and above was 26.28% (Basic Health Research, 2018). The data from the Public Health Office of Jambi in 2021 informed that from 20 Community Health Centres in Jambi City, Paal V Community Health Centre has a hypertension incidence rate of 4.00%, this number increased from last year which only peaked at 3.15% in 2020, 1.91% in 2017, and 2.96% in 2018, but sharply increased to 11.33% in 2019.

METHODOLOGY

The study was an observational analytic research with cross sectional study design. The study was conducted in the working area of Paal V Public Health Centre of Jambi City in 2021. The research sample was people live in the working area of Paal V Public Health Centre of Jambi City who get treated at Paal V Public

Health Centre in 2020 during the study's course, which amounted to 214 people. The independent variable in the study was the incidence of hypertension. The definition of the incidence of hypertension mentioned in the study is the condition of a person having systolic blood pressure of ≥ 140 mmHg and 90 mmHg of diastolic in two measurements at an interval of five minutes. The dependent variables in this study were age, gender, education, salt consumption, stress, smoking, and physical activity. Data collection techniques were interviews and measurements

The measurement of the salt consumption variable was obtained from the respondents' salt consumption habits during the last 24 hours which was then inputted into the Nutrisurvey software to get the amount of salt consumption in a day. Then categorized as high if respondents consume salt more than one teaspoon/2000 mg per day, and categorized as low if respondents consume salt less than one teaspoon/2000 mg per day. The stress variable was measured by using SRQ-20 (Self-Reporting Questionnaire) in which respondents are categorized as stressed if they had a stress value of ≥ 6 and be categorized as not stressed if the value is < 6. Physical activity variables were measured based on the MET (Metabolic Equivalent of Task) value, categorized in the light category if the MET value is <600, the moderate category if the MET value ≤ 600 and ≤ 3000, and the vigorous category if the MET value is ≥ 3000. Data analysis used the chi-square test for bivariate and cox regression logistic for multivariate analysis. Data were analysed through a chi-square test for bivariate and cox regression logistic for multivariate analysis.

RESULTS

Table 1. The Distribution of Respondent Characteristics in the Working Area of Paal Lima Public Health Centre

Respondent Characteristic	n	%
Hypertension		
Yes	71	33.2%
No	143	66.8%
Gender		
Male	93	43.5%
Female	121	56.5%
Age		
≥45 years old	119	55.6%
<45 years old	95	44.4%
Marriage status		
Married	168	78.5%
Not married	27	12.6%
Widows/Widowers	19	8.9%
Education		
No education	1	0.5%
Elementary School graduate	18	8.4%
Junior High School graduate	51	23.8%
Senior High School graduate	105	49.1%

University graduate	39	18.2%
Occupation		
No occupation	2	0.9%
Labor/Farmer	23	10.7%
Public Servant/Army/Police	12	5.6%
Merchants/Entrepreneurs	20	9.3%
Others (Housewife/Students/Retiree/employee)	157	73.4%
Salt Consumption		
High	32	15%
Low	182	85%
Stress		
Stressed	54	25.2%
Not stressed	160	74.8%
Physical activity		
Light	21	9.8%
Moderate	61	28.5%
Vigorous	132	61.7%
Smoking		
≥10 bars	17	7.9%
<10 bars & not smoking	197	92.1%

The prevalence of the incidence of hypertension in this study was 33.2%, in which 56.5% are female, 55.6% aged ≥ 45 years old, 78.5% are married, 49.1% are high school graduates, 73.4% are in others category (housewives/students/retirees/employees), 85% with low salt consumption, 74.8% are not stressed, 61.7% conduct vigorous physical activity, and 92.1% fall in the category of smoking <10 bars and not smoking.

Table 2. Risk Factors of Hypertension

Variable	Hypertension		**No hypertension**		**Total**		**PR (95%CI)**	**P-value**
	N	**%**	**n**	**%**	**N**	**%**		
Age								
≥ 45 years old	59	49.6	60	50.4	119	100	3.925 (2.244-6.865)	0.000
< 45 years old	12	12.6	83	87.4	95	100		
Gender								
Male	29	31.2	64	68.8	93	100	0.898(0.609-1.325)	0.158
Female	42	34.7	79	65.3	121	100		
Education								
Low	22	31.4	48	68.6	70	100	0.924(0.610-1.397)	0.05*
High	49	34.0	95	66.0	144	100		

Salt Consumption								
High	24	75.0	8	25.0	32	100	2.904 (2.115-3.989)	0.000
Low	47	25.8	135	74.2	182	100		
Stress								
Stressed	47	87.0	7	13.0	54	100	5.802 (3.956-8.510)	0.000
Not stressed	24	15.0	136	85.0	160	100		
Physical Activity								
Light	12	57.1	9	42.9	21	100		
Moderate	32	52.5	29	47.5	61	100	2.794 (1.415-5.514)	0.003
Vigorous	27	20.5	105	79.5	132	100	2.565 (1.537-4.280)	0.000
Smoking								
≥10 bars	10	58.8	7	41.2	17	100	1.900 (1.212-2.977)	0.030
<10 bars & not smoking	61	31.0	136	69.0	197	100		

According to Table 2, it is shown that risk factors that are correlating with the incidence of hypertension encompass Age, Education, Salt Consumption, Stress Condition, Physical Activity, and Smoking.

Table 3. The Final Model of Risk Factors of the Incidence of Hypertension

Variable	*P*	aPR	95%CI
Age	0.006	2.502	1.302 – 4.809
Salt consumption	0.023	1.799	1.086 – 2.978
Stress	0.000	3.963	2.355 – 6.670

According to Table 3, it is known that age (aPR= 2.502; 95% CI: 1.302 to 4.809), salt consumption (aPR= 1.799; 95% CI: 1.086 to 2.978), and stress (aPR= 3.963; 95% CI: 2.355 to 6.670) are proved as significantly correlated and are the risk factors of incidence of hypertension. Apart from that, based on the results of the multivariate analysis, it was found that the most dominant factor affecting the incidence of hypertension was stress. Stressed people were 3.9 times more likely to suffer from hypertension than people without stress after controlled by age, salt consumption, and physical activity factors.

DISCUSSIONS

Age

The study results showed that the proportion of the incidence of hypertension was mostly (55.6%) at the age of >45 years. The proportion who experienced hypertension in the age group > 45 years (49.6%) was greater than

in the age group < 45 years (12.6%). There was a correlation between age and the incidence of hypertension and people aged > 45 years were 3.29 times more likely to suffer from hypertension compared to people aged <45 years. In the multivariate analysis, the age variable became the dominant factor in the incidence of hypertension in addition to the stress factor and family history. The results showed that the risk of suffering from hypertension on people aged ≥ 40 years were 2.509 times higher compared to those aged < 40 years.

A consistent study also acquired that age is correlated with the incidence of hypertension in which the incidence of hypertension in the old ages (83.3%) were greater compared to young ages (16,7%) (Aristoteles, 2018). The other study indicated that age at risk >40 years (59.6%) has a greater proportion than age <40 years (29.9%). The risk of suffering from hypertension in old ages was 1.96 higher compared to the age of <40 years old (Maulitanisa, 2019). Most of the respondents in old ages (83.3%) suffered from hypertension more compared to respondents in young ages (16,7%) and age was correlated with the incidence of hypertension. This result is contradictory to Santosa (2016) which stated that age is not correlated with the incidence of hypertension in the Kenduran Public Health Centre of Tuban, the difference of this study is regarding the age categories, namely > 55 years old and > 55 years old. In addition, the sample in the study was lower, namely 75 respondents (Santosa et al., 2016).

The age factor is an inevitable matter, naturally, age will add up with time. It is scientifically known that with increasing age, the elasticity of blood vessels will increase. The correlation between the incidence of hypertension and the age factor was due to the age group of >40 years old suffered more from hypertension. When they get older, the function of human organs will weaken and are susceptible to disease, but those who are young cannot be separated from the possibility of experiencing hypertension due to poor diet, obesity, stress, poor lifestyle such as lack of physical activity or exercise that over time might become a risk factor for hypertension. With increasing age, it is necessary to pay attention and maintain a healthy diet and healthy behavior in preventing non-communicable diseases, especially hypertension.

Gender

It is acquired from the study results that there were fewer males in the proportion of respondents (43.5%) compared to females (56.5%). While, the males experienced fewer hypertension (31.2%) compared to females (34.7%). There was no significant correlation between male and female genders with the incidence of hypertension.

A consistent study stated that gender is not correlated with the incidence of hypertension in Kenduran Public Health Centre of Tuban, this might be caused by the female category that dominated the study (80%) (Santosa et al., 2016). Another study also acquired that gender is not correlated with the incidence of hypertension. This might be caused by the proportion of respondents that experienced hypertension is male. The other study also discovered that the incidence of hypertension is experienced mostly by male (81.81%) compared to female (61.90%) (Wicaksono, 2015). It can be seen from the intensity that hypertension in women is heavier than men (Kusumawaty et al., 2016)

According to Cortas (2008), the prevalence for the possibility of hypertension to occur in men is similar with women. However, women are protected from cardiovascular diseases prior to menopause. Women who yet to enter the menopause stage are protected by estrogen hormone that contribute to the improvement of HDL level. A high HDL level is a protective factor in preventing events of atherosclerosis. The estrogen protection effect is considered as an explanation for the women immunity in pre-menopause ages (Najmi Raihan & Pristiana Dewi, 2014). It is necessary to conduct actions to prevent and control non-communicable diseases which in this context is hypertension regardless of the gender.

Salt Consumption and the Incidence of Hypertension

The research results obtained 32 (15%) respondents who consumed high-sodium foods with a salt consumption of 3.929 mg/day and 84 mg/day was the lowest salt consumption. Hypertension was experienced more in respondents with high category of salt consumption (75%) compared to respondents with low salt consumption (25.8%). There was a significant correlation between the high category of salt consumption and hypertension. The risk of suffering from hypertension in people who consume salt in high category is 2.9 times greater compared to those in low category.

In the multivariate analysis, the variable of salt consumption became the dominant factor towards the incidence of hypertension in addition to age and stress factors. It has been acquired that the risk of suffering from hypertension in people aged $\geq$ 40 years old is 2.509 times greater compared to people aged < 40 years old. A consistent study, namely a study on elderly in the area of Taman Sari Public Health Centre of Pangkal Pinang City has found a correlation between salt consumption and the incidence of hypertension in which the proportion of the incidence of hypertension was higher in respondents with high consumption of salt (67,3%)(Misyati & Asmaruddin, 2019). The pattern of salt consumption was correlated with the incidence of hypertension in which elderly experience hypertension due to the high pattern of salt consumption (78.6%) (Purwono et al., 2020). There was a correlation between salt consumption and pre-hypertension incidence, the proportion of high salt consumption was more likely (64.7%) to experience pre-hypertension in elderly (Imelda et al., 2020).

The level of salt in food is known by measuring the amount of consumption of foods containing sodium using the Nutrisurvey application. Examples of foods that contain high levels of salt include meatballs, salted anchovies, cheese bread, *pindang* fish and others. Foods that contain high levels of salt are one of the causes of increased blood pressure because salt contains sodium ions which can shrink the diameter of the arteries, so the heart has to pump harder to push the blood volume which is getting narrower and will cause blood pressure to increase. The opposite will also happen when sodium intake is reduced so will blood volume and blood pressure in some individuals (Darmawan et al., 2018). Salt causes fluid to accumulate in the body because it prevents fluid from being removed from the cells, thereby increasing the volume and pressure of blood in the body. In about 60% of cases of primary (essential)

hypertension, there is a response to lowering blood pressure by reducing salt intake (Ministry of Health of RI, 2013).

Lack or excessive salt intake is not good for health. Low salt intake can cause low sodium in cells, thereby inhibiting sodium's ability to retain water in cells which makes the body dehydrated and loses appetite. Consuming excess salt increases the amount of sodium in the cells and causes fluid imbalance. As fluid enters the cells, the diameter of the arteries becomes smaller and the heart pumps blood more forcefully, resulting in an increase in blood pressure. An increase in blood pressure affects an increase in the work of the heart which can increase the risk of having a heart attack and stroke (P2PTM Kemenkes RI, 2018). It is necessary the need to maintain the amount of food consumption with sufficient salt content.

Stress and the Incidence of Hypertension

The results showed that the proportion of respondents as many as 54 (25.2%) experienced stress. There was more proportion that sufferred from hypertension in respondents who are in stress (87%) compared to respondents who do not experience stress (15%). Stress was correlated with the incidence of hypertension. The risk of suffering from hypertension was 5.8 times greater in people who have stress symptoms than people who do not have stress symptoms. In the multivariate analysis, the stress variable became the most dominant factor in the incidence of hypertension in addition to being controlled by age and family history variables. The results showed that the risk of suffering from hypertension was 3.96 times greater in people who are in stress compared to people who are not stressed.

These study results are consistent with a study that indicated the correlation between stress and hypertension with a p-value of 0.041 (Awaluddin et al., 2018). The study of Jannah et al. (2017) showed a correlation between stress and the incidence of hypertension with a p-value of 0.003 (Jannah et al., 2017). Stress levels are correlated with the incidence of hypertension in elderly in the Public Health Centre of Air Dingin Lubuk Minturun (Imelda et al., 2020). Stress is correlated with the incidence of hypertension. Hypertension sufferers who experience mild stress are generally not damaged physiologically, mild stress might motivate individuals to learn and capable of solving problems effectively. Such a situation is usually ended in several minutes or hours. The score of low stress or mild stress is correlated with the tension in daily lives which causes individuals to be aware and have their perceptual field improved, thereby this condition will motivate individuals to learn understanding changes, especially changes to feelings of discomfort that take place in survival (Angelina et al., 2021). A similar result also acquired in which stress is correlated with the incidence of hypertension with a p-value of 0.001 (Ardian, I., Haiya, Nutrisia N., Sari, 2018).

Strong emotional states and intense stress can and will continue for a long time to become a somatic reaction. It directly affects the circulatory system, thereby affecting the heart rate and blood flow system. Physiologically, stress can cause an increase in pulse rate, blood pressure, respiration, and arrhythmias. In

addition to the physiological response, the release of the hormone adrenaline after stress might cause blood pressure to rise and blood clots which might lead to a heart attack. Adrenaline can also make the heart beat faster and constrict coronary arteries, this can trigger diseases including hypertension (Ardian, I., Haiya, Nutrisia N., Sari, 2018).

Stress is an individual mechanism. Adaptation to stress will differ from one another because it depends on a person's age, gender, personality type, emotion, social status or occupation. The physiological response to stress causes an increase in pulse rate, blood pressure, respiration and arrhythmias. In addition, the release of the hormone adrenaline as a result of severe stress causes an increase in blood pressure and blood clots, increasing the risk of heart attack. Adrenaline can also speed up the heart rate and narrow the coronary blood vessels (Widya Sari et al., 2018). It is necessary to prevent and control stress by getting enough rest, recreation, sports and steadfastness in praying.

Physical Activity and the Incidence of Hypertension

The research results showed that 21 respondents (9.8%) conduct light physical activities, 28.5% conduct moderate physical activities, and the rest 61.7% conduct vigorous physical activities. The MET value of respondents who conduct light physical activities was < 600. The proportion of hypertension in people with light activities was greater (57.1%) than people with moderate activities (52.5%) and vigorous activities (20.5%). Physical activity was correlated with the incidence of hypertension and people with light activities are 2.794 times more likely to be at risk compared to people with moderate physical activities, and 2.565 times for people with vigorous physical activities.

These study results are consistent with a study that showed a correlation between physical activity and the incidence of hypertension with a p-value of 0.005 (Rihiantoro & Widodo, 2018). Physical activity is correlated with the incidence of hypertension with a p-value of 0.000 (Purnamasari Endah, 2019). There is a correlation between people with irregular physical activities and the incidence of hypertension. The proportion of those with irregular physical activities is greater (26.4%) compared to those with routine physical activities (11.%) (Angelina et al., 2021). There is a correlation between the incidence of hypertension and physical activity. Such physical activities encompass various body movements, starting from sports, daily activities in household, and during the work. Physical activities that are done regularly causes changes, for example, the heart will get stronger in its smooth muscles so that the capacity is large and the contraction or pulse is strong. During the study at the South Alalak Public Health Center that most of these patients did strenuous physical activity because many of the patients work from morning to evening and did heavy physical activities such as lifting heavy weights so that they lacked rest (Oktavia et al., 2021).

Physical activity is any body movement that involves skeletal muscles and results in energy expenditure. Regular physical activity increases physical endurance and physical activity is carried out according to the ability of each individual (Ministry of Health of Republic of Indonesia, 2019). Physical activity

affects blood pressure, the higher the physical activity, the lower the risk of a person developing high blood pressure. People with light activity are 30-40% more likely to develop hypertension than people who do moderate or vigorous physical activity. Moderate to vigorous physical activity lowers blood pressure. The mechanism of lowering blood pressure due to physical activity is assumed to be caused by a decrease in peripheral resistance. Physical activity reduces sympathetic nerve activity, healthier blood vessels, avoids oxidative stress and inflammation, suppresses renin activity, dilates blood vessels and lowers blood pressure (Wedri et al., n.d.). It is necessary to conduct regular physical activity for at least 30 minutes/day which can prevent hypertension and other non-communicable diseases.

Smoking and the Incidence of Hypertension

The results showed that the proportion of respondents who smoked more than 10 cigarettes per day was 17 (7.9%) with a range of 10-40 cigarettes per day. The proportion of hypertension in smokers who smoked > 10 cigarettes/day was greater (58.8%) compared to <10 cigarettes/day/Not smoking (31.%). There is a correlation between the incidence of hypertension and smoking behavior. The risk of suffering from hypertension is 1.9 times greater in people who smoke ≥ 10 bars per day compared to people who do not smoke or smoke < 10 bars per day.

This study result is consistent with the study of Pitriani et al. (2018) which indicated the correlation between smoking and the incidence of hypertension with a p-value of 0.001 (Pitriani, Risa. Yanti, J. S., Afni, 2018). There is a correlation between smoking and the incidence of hypertension in which 67.6% of hypertension occurred in those with smoking behavior (Jannah et al., 2017). There is a correlation between smoking habit and the incidence of hypertension, and people with smoking habit are 2.883 more at risk compared to non-smokers (Angelina et al., 2021). There is a correlation between smoking habit variable and the incidence of hypertension variable in patients of Kombi Public Health Centre. The correlation strength between smoking habit and the incidence of hypertension was strong and went to a positive direction (Memah et al., 2019)..

The nicotine-induced increase in blood pressure occurs immediately after the first puff. Nicotine is absorbed by the tiny blood vessels in the lungs and circulated into the blood. In just a few seconds, nicotine reaches the brain. The brain responds to nicotine by signaling the adrenal glands to release epinephrine (adrenaline). This hormone constricts blood vessels and forces the heart to work harder due to higher pressure. After smoking only two cigarettes, systolic and diastolic blood pressure increased by 10 mmHg. Blood pressure will stay at this level until 30 minutes after smoking (Rahmatika et al., 2019). Cigarette's smoke might cause cataract, hair loss, oral cancer, nasal cancer, blood vessel diseases, lung cancer, sperm deterioration, and many more (The Ministry of Health of RI, 2017).

The difference of the occurrence of hypertension was due to the difference in the proportion of respondents' behavior regarding the number of smoked cigarettes, or smoking > 10 bars per day and not smoking behaviors. The type of smoked cigarettes is filtered cigarette. Smoking behavior is dominant in men. The

awareness and intention of individuals who already fell in smoking behavior is required to conduct a preventive effort by reducing the number of smoked cigarettes and trying to stop smoking.

CONCLUSIONS AND RECOMMENDATIONS

In this study, the risk factors for the incidence of hypertension were age, salt consumption and stress. The most dominant factor was stress. It is hoped that the community can change into a healthier lifestyle such as reducing the consumption of foods that contain high salt or using a special salt that is low in sodium and doing activities for at least 30 minutes/day. In addition, stress management also needs to be done in order to avoid or reduce the stress experienced by the community. It is deemed necessary for Public Health Centre to conduct hypertension screening and increase efforts to disseminate information to the public, especially regarding stress management and reducing the consumption of high-salt foods on a regular and continuous basis.

FURTHER STUDY

Unchangeable factors affecting hypertension are education, gender, occupation, family history, and age. While changeable factors affecting the risk of hypertension are nutritional status, physical activities, alcohol consumption, smoking, salt consumption, and high-fat food consumption (Rusdi, 2009). Bustan (2007) also explained that factors that might cause hypertension include race/tribe, age, urban/rural, obesity, geography, gender, high sodium diet, stress, cigarettes, diabetes mellitus, water composition (sodium, cadmium lead), alcohol, coffee, and contraceptive pills (Bustan, 2007).

REFERENCES

Afiah, W., Yusran, S., & Muhamad Sety, L. O. (2018). Faktor Risiko Antara Aktivitas Fisik, Obesitas dan Stress Dengan Kejadian Penyakit Hipertensi Pada Umur 45-55 Tahun Di Wilayah Kerja Puskesmas Soropia Kabupaten Konawe Tahun 2018. *Jimkesmas*, *3*(2), 1–10.

Angelina, C., Yulyani, V., & Efriyani, E. (2021). Faktor-Faktor Yang Mempengaruhi Kejadian Hipertensi Di Puskesmas Biha Pesisir Barat Tahun 2020. *Indonesian Journal of Health and Medical*, *1*(3), 404–416.

Ardian, I., Haiya, Nutrisia N., Sari, T. U. (2018). Signifikansi Tingkat Stres Dengan Tekanan Darah Pada Pasien Hipertensi. *Jurnal Keperawatan Universitas Islam Sultan Agung*, *1*(1), 152–156.

Aristoteles. (2018). Korelasi umur dan jenis kelamin dengan penyakit hipertensi di emergency center unit rumah sakit islam siti khadijah palembang 2017. *Indonesia Jurnal Perawat*, *3*(1), 9–16.

Aryantiningsih, D. S., & Silaen, J. B. (2018). Hipertensi pada Masyarakat di Wilayah Kerja Puskesmas Harapan Raya Pekanbaru. *IPTEKS TERAPAN*, *1*, 144.

Awaluddin, Hasifah, & Pajeriaty. (2018). Faktor yang Berhubungan dengan kejadian hipertensi Di Wilayah Puskesmas Mandalle Kecamatan Mandalle Kabupaten Pangkep. *Jurnal Ilmiah Kesehatan Diagnosis*, *12 No 6*, 583–588.

Bustan, D. M. N. (2007). *Epidemiologi Penyakit Tidak Menular* (2nd ed.). Rineka Cipta.

Darmawan, H., Tamrin, A., & Nadimin, N. (2018). Hubungan Asupan Natrium dan Status Gizi Terhadap Tingkat Hipertensi Pada Pasien Rawat Jalan Di RSUD Kota Makassar. *Media Gizi Pangan*, *25*(1), 11. https://doi.org/10.32382/mgp.v25i1.52

Depkes RI. (2006). *Pedoman Teknis Penemuan dan Tatalaksana Penyakit Hipertensi-*.

Firmansyah, M. R., & Rustam. (2017). Hubungan Merokok dan Konsumsi Kopi dengan Tekanan Darah pada Pasien Hipertensi. *Jurnal Kesehatan*, *8*(2), 263. https://doi.org/10.26630/jk.v8i2.495

Imelda, I., Sjaaf, F., & Puspita, T. (2020). Faktor-Faktor Yang Berhubungan Dengan Kejadian Hipertensi Pada Lansia Di Puskesmas Air Dingin Lubuk Minturun. *Health & Medical Journal*, *2*(2), 68–77. https://doi.org/10.33854/heme.v2i2.532

Jannah, M., Nurhasanah, M., N. A., & Sartika, R. A. (2017). Analisis Faktor Penyebab Kejadian Hipertensi di Wilayah Puskesmas Mangasa Kecamatan Tamalate Makassar. *Jurnal PENA*, *3*(1), 410–417.

Kemenkes RI. (2013). *Pedoman Teknis Penemuan dan Tatalaksana Hipertensi*.

Kemenkes RI. (2017). Hidup Sehat Tanpa Rokok. *Kementrian Kesehatan Indonesia*, *ISSN 2442-7659*, 06–07.

Kusumawaty, J., Hidayat, N., & Ginanjar, E. (2016). Hubungan Jenis Kelamin dengan Intensitas Hipertensi pada Lansia di Wilayah Factors Related Events Sex with Hypertension in Elderly Work Area Health District Lakbok Ciamis. *Jurnal Mutiara Medika*, *16*(2), 46–51.

Maulitanisa, H. (2019). Faktor-Faktor yang Berhubungan dengan Kejadian

Hipertensi pada Masyarakat RW 009 Kelurahan Bojong Menteng Bekasi 2018. *ARKESMAS (Arsip Kesehatan Masyarakat)*, *4*(1), 143–148. https://doi.org/10.22236/arkesmas.v4i1.3143

Memah, M., Kandou, G. D., & Nelwan, J. E. (2019). Hubungan Antara Kebiasaan Merokok Dan Konsumsi Alkohol Dengan Kejadian Hipertensi Di Puskesmas Kombi Kecamatan Kombi Kabupaten Minahasa. *Kesmas*, *8*(1), 68–74.

Ministry of Health Republic of Indonesia. (2019). *Tiga Tahun GERMAS Lessons Learned*.

Misyati, & Asmaruddin. (2019). Hubungan Obesitas, Aktivitas Fisik, Kebiasaan Merokok, Konsumsi Garam Berlebihan dengan Kejadian Hipertensi pada Lansia di Wilayah Kerja Puskesmas Taman Sari Kota Pangkalpinang Tahun 2019. *Jurnal Ilmiah Kesehatan Masyarakat STIKES Abdi Nusa Pangkalpinang*, *3*(1), 1–7. http://jurnalabdinusababel.ac.id/index.php/jurnal/article/view/18/15

Najmi Raihan, L., & Pristiana Dewi, A. (2014). Faktor-Faktor Yang Berhubungan Dengan Kejadian Hipertensi Primer Pada Masyarakat Di Wilayah Kerja Puskesmas Rumbai Pesisir. *Jom Psik*, *1*(OKTOBER), 1.

Oktavia, E., Rizal, A., & Hayati, R. (2021). *Hubungan Jenis Kelamin, Aktivitas Fisik dan Pola akan dengan Kejadian Hipertensi pada Masyarkat Di Wilayah Kerja Puskesmas Alalak Selatan Kota Banjarmasin Tahun 2021*.

P2PTM Kemenkes RI. (2018). *Pengaruh Konsumsi Garam Berlebih terhadap Penyakit Tidak Menular*.

Pitriani, Risa. Yanti, J. S., Afni, R. (2018). Faktor-Faktor yang Mempengaruhi Kejadian Hipertensi pada Lansia di Wilayah Kerja Puskesmas Rumbai Pesisir. *Jurnal Penelitian Kesehatan Suara Forikes*, *9*(1), 74–77.

Purwono, J., Sari, R., Ratnasari, A., & Budianto, A. (2020). Pola Konsumsi Garam Dengan Kejadian Hipertensi Pada Lansia. *Jurnal Wacana Kesehatan*, *5*(1), 531. https://doi.org/10.52822/jwk.v5i1.120

Riset Kesehatan Dasar. (2018). Laporan Nasional Riset Kesehatan Dasar. *Kementrian Kesehatan RI*, 1–582.

Riskesdas. (2018). *Laporan Riskesdas Propinsi Jambi2018*. 500.

Rusdi, N. (2009). *Awas! Anda Bisa Mati Cepat Akibat Hipertensi dan Diabetes* (I). Power Books (IHDINA).

Santosa, L., Chasani, S., & Pramudo, S. (2016). Faktor Risiko Kejadian Hipertensi Di Puskesmas Kenduruan, Kabupaten Tuban. *Jurnal Kedokteran Diponegoro*, *5*(4), 1182–1191.

Sumajow, M. R., Kandou, G. D., & Langi, F. L. F. G. (2020). Faktor - Faktor yang Berhubungan dengan Penyakit Hipertensi pada Masyarakat di wilayah Kerja Puskesmas Minanga Kota Manado. *KESMAS*, *9*(4), 118–123.

Sutanto. (2010). *Cekal (Cegah dan Tangkal) Penyakit Modern Hipertensi, Stroke, Jantung, Kolestrol, dan Diabetes* (Yogyakarta). C.V Andi Offset.

Tarigan, A. R., Lubis, Z., & Syarifah, S. (2018). Pengaruh Pengetahuan, Sikap Dan Dukungan Keluarga Terhadap Diet Hipertensi Di Desa Hulu Kecamatan Pancur Batu Tahun 2016. *Jurnal Kesehatan*, *11*(1), 9–17. https://doi.org/ 10.24252/ kesehatan. v11i1.5107

Wedri, N. M., Windayanti, K. A., Kesehatan, P., & Denpasar, K. (n.d.). *Tekanan Darah Pekerja Di Rumah Selama Masa Pandemi Covid-19*. 16–27.

WHO. (2013). Global Brief on Hypertension: Silent Killer, Global Public Health Crisis. *Indian Journal of Physical Medicine and Rehabilitation*, *24*(1), 2–2. https://doi.org/10.5005/ijopmr-24-1-2

Wicaksono, S. (2015). Lansia Dengan Peningkatan Tekanan Darah (Hipertensi) Di Dusun 1 Desa Kembangseri Kecamatan Talang Empat Bengkulu Tengah Tahun 2015. *Fakultas Kedokteran Dan Ilmu Kesehatan Universitas Bengkulu*, 1–6.

Widanti. (2013). *Keamanan Pangan Jilid 2* (2nd ed.). Mbiro Press.

Widya Sari, T., Kartika Sari, D., Kurniawan, Mb., Herman Syah, Mi., Yerli, N., Qulbi, S., Ilmu Kesehatan Masyarakat, D., Kedokteran dan Ilmu Kesehatan, F., & Program Studi Profesi Dokter, M. (2018). Hubungan Tingkat Stres Dengan Hipertensi Pada Pasien Rawat Jalan Di Puskesmas Sidomulyo Rawat Inap Kota Pekanbaru. *Collaborative Medical Journal (CMJ)*, *1*(3), 55–65.

Widyanto, C. F., & Triwibowo, C. (2013). *Trend Disease Trend Penyakit Saat Ini* (I). CV. Trans Info Media.