

RISK FACTORS FOR ELDERLY'S HYPERTENSION IN SOUTH TANGERANG, INDONESIA: A CASE CONTROL STUDY

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ABSTRACT

Hypertension is a serious problem around the world. This is due to the high prevalence of hypertension and tend to increase in the future. This study aimed to determine factors associated with hypertension in elderly lived in South Tangerang, Indonesia. This study is a case control (age matched at the 1:1 ratio) and based on an elderly population that was conducted in South Tangerang, Indonesia in 2019. Along with the descriptive statistics, chi square analysis and logistic regression model was done using SPSS to calculate the odds ratio. Multivariate analysis obtained the highest Odd Ratio (OR) value were the variable use of contraception before menopause (OR = 3,149). The multivariate summary analysis model with the value of R square = 0,577, it means that the variable use of contraception can explain 57,7% variable hypertension. And there 42,3% variables or other factors that were not studied to explain the hypertension variable in the elderly at the South Tangerang, Banten, Indonesia. Variable of contraceptive use is the determinant risk factor in the incidence of hypertension in elderly after controlling by family history variables, habit of consuming salty food, habit of consuming saturated fat, habit of physical activity, stress, and age. By that results, women of childbearing age in Indonesia especially South Tangerang should use contraceptives that do not affect hormones, including IUD (Intra Uterine Device) contraception and condoms.

Keywords: Risk Factor, Elderly, Hypertension.

I. INTRODUCTION

Indonesia is currently undergoing an epidemiological transition in line with demographic and technological transition. This also contributes to the emergence of causes as the main factors of morbidity and mortality, from infectious diseases which are generally caused by disease-carrying agents to non-communicable diseases (NCD) that caused by human behaviour and degenerative factors.¹ NCD is the main cause of death in developed countries.² The death rate caused by NCD in Indonesia according to World Health Organization (WHO) in 2008 was 647 per 100,000 population.³ Hypertension is one of the NCD in Indonesia which is most at risk of causing death. The Ministry of Health Republic of Indonesia stated that hypertension is the third highest cause of death in Indonesia with a Case Fatality Rate (CFR) of 4.81%.⁴

The prevalence of hypertension in the world tend to increase as a result of the increasing population of the elderly over 80 years, which has exponentially increased over the last 40 years, especially in developing countries.⁵ Studies conducted at Framingham showed that increasing age indicates the development of hypertension in about 91% to 93%.⁶ Approximately one in four adults in America has hypertension.

II. LITERATURE REVIEW

Hypertension must be controlled as soon as possible because otherwise it will cause interference with other organs such as the heart, kidneys, and blindness.⁷ Uncontrolled hypertension can have a 7 times greater chance of having a stroke and 6 times more likely to suffer from congestive heart failure, and 3 times more likely to have a heart attack.⁸ Lloyd-Jones, et al (2005) who observed the elderly 80 years and over had the largest prevalence of hypertension. The average diastolic blood pressure (DBP) increases until a person is 55 years old and decreases throughout the rest of life. However, this is inversely related to systolic blood pressure which increases until the end of age.⁹ In this case, the elderly have a high risk of hypertension due to the increase in systolic, even someone whom aged of 65 does not suffer from hypertension still has a risk of hypertension up to 90%.¹⁰

WHO and the International Society of Hypertension (ISH), stated that in the worldwide there were 600 million people who suffered from hypertension and 3 million of them died every year because there were patients who are not properly and massively getting treatment.¹¹ In the worldwide there are 972 million people or 26.4% of people suffering from hypertension, this figure could potentially increase to 29.2% by 2025. Besides, 972 million people with hypertension, 333 million in developed countries and 639 million others in developing countries,¹² including Indonesia.

Based on the report from Data and Information Center Ministry of Health Republic of Indonesia in hypertension (2014), people who suffered from hypertension were 25% or 65,048,110 people from the entire population and the most patients were the elderly, 45.9% (55-64 years), 57.6% (65-74 years), and 63.8% (≥ 70 years).¹³ In Banten Province, the number of hypertension patients at the age of 18 years and over showed a lower number (27,6%) than the national number of hypertension patients, but when compared with the results of the diagnosis conducted by health personnel, the hypertension rate in Banten Province is quite high when compared to the national figure (8.7%).¹⁴ As for essential hypertension, based on a report by the Central Bureau of Statistics for South Tangerang in 2016, it became 2 of the 10 most common diseases in outpatients at South Tangerang.¹⁵

The number of morbidity and mortality due to hypertension can be lowered by lowering blood pressure, this is based on research conducted by Ridjab (2007). The first step in managing blood pressure is adjusted to the recommendations of the Joint National Committee, including lifestyle modifications such as weight loss, adopting a DASH (Dietary Approach to Stop Hypertension) combination diet, reducing salt intake, regular physical activity, and limiting alcohol intake. If the expected blood pressure target is not achieved after the implementation of lifestyle modifications, the next step of treatment can be done by administering antihypertensive drugs.¹⁶

Hypertension patients are very heterogeneous. Hypertension can be suffered by anyone who is at risk. In hypertension, there is a double risk term, where there is a risk that comes from endogenous or exogenous factors. Endogenous risk factors are risk factors that come within human body, such as hormones, while exogenous risk factors are risk factors that come from outside the human body such as smoking, stress, and so on.¹⁷ The risk factors for hypertension according to the Ministry of Health of the Republic of Indonesia are age, gender, family history, genetics (risk factors that cannot be changed / controlled), smoking habits, salt consumption, consumption of saturated fats, use of used cooking, consumption habits of alcohol, obesity, lack of physical activity, stress, use of estrogen.¹³

Hypertension is a serious problem around the world. This is due to the high prevalence of hypertension and is likely to increase in the future. In addition, hypertension is sometimes accompanied by other diseases that also tend to increase, such as strokes and death. Currently hypertension is also suffered by many young adults, this is a burden in itself for the family economy because hypertension treatment itself takes a long time and is quite expensive.¹⁸ The results of other studies found that the prevalence of hypertension tends to increase as a person ages. In addition, this study also states that in Indonesia, around 1.8 - 28.6% of hypertension patients are people aged over 60 years. There are two causes of hypertension, namely irreversible risk factors and modifiable risk factors. Hypertension can occur when there are interactions between two or more risk factors. If there is only one risk factor without being accompanied by other risk factors, then hypertension may not necessarily occur.¹⁹

The current trend from the report of Center Bureau of Statistics for South Tangerang is hypertension patients are more common in urban communities compared to people living in villages due to differences in life patterns. Hypertension risk factors such as obesity and stress are more likely to be experienced by people who live in urban areas. Because at this time, the diet of urban people tends to be not good, namely consuming ready-to-eat

foods that contain lots of fat, are high in salt, and are low in dietary fiber.²⁰In a study conducted by Rustiana (2014), regarding the description of factors related to the incidence of hypertension at the Ciputat Timur Primary Health Care, South Tangerang, it was found that hypertension patients were more dominant in the female. In addition, seen from other factors such as age, people with hypertension are more dominant in the age range 57-66 years. On other risk factors, patients with a family history of hypertension, patients with obesity, patients who frequently consume salty foods, patients who smoke, patients who rarely do physical activity and patients who experience stress are more likely to develop hypertension in the working area of Puskesmas Ciputat Timur.²¹The research conducted by Rana et al (2018) shows that hypertension is largely determined by a series of modifiable risk factors. The most common modifiable risk factors leading to hypertension are diabetes mellitus, excess dietary salt, obesity, inadequate physical activity and lack of sleep.²²

III. MATERIALS AND METHODS

Study Area

This study was conducted in South Tangerang. South Tangerang is a city in the province of Banten, Indonesia. Located 30 km (19 mi) on the southwestern border of Jakarta, the city forms part of the Greater Jakarta metropolitan area. According to the 2010 Census, its population was 1,290,322 and at the Intermediate 2015 Census this had risen to 1,538,970, while the latest official estimate in mid-2020 is 1,799,605. The total area is 147.19 km² (56.83 sq mi) (fig. 1).²³



Fig. 1. South Tangerang, Banten, Indonesia

As for essential hypertension, based on a report by the Central Bureau of Statistics for South Tangerang in 2016, it became 2 of the 10 most common diseases in outpatients at South Tangerang. Hypertension patients are more common in urban communities compared to people living in villages due to differences in life patterns. Hypertension risk factors such as obesity and stress are more likely to be experienced by people who live in urban areas.¹⁵

Study Design and Population

This is a case control study that carried out from April to August 2020 in South Tangerang, Banten, Indonesia. The population in this study were all residents who carried out outpatient treatment at the Internal Medicine Department of the South Tangerang City Hospital during 2019, which amounts to 5256 people. In determining the sample, the technique of determining sample members uses simple random sampling because a sample frame has been obtained in the form of the serial number of the research subject, address, date of birth, and so on, where each element or member of the population has the same opportunity to be selected as the sample. We estimated that a sample size in case and control of 1:1 ratio, with a power of 90% at a significant level of 0.05, the required sample size was calculated as 98 respondents in each group.

Study Participants

Elderly patients with hypertension who seek treatment the Internal Medicine Department, South Tangerang Hospital was used for selection of cases. This information was obtained from patients medical reports in South Tangerang Hospital, Banten, Indonesia. We excluded cases, elderly patients with hypertension who are not willing to be respondent and elderly who seek treatment at Internal Medicine Department but not diagnosed with hypertension. Controls were from same living area of cases matched with age with no history of hypertension in last one year.

Data and Variables

Data for the study was extracted from medical records of South Tangerang Hospital, Banten, Indonesia. For the data collection, cases and controls were interviewed with a questionnaire in Indonesian language. The variables analyzed were hypertension status, age (60 – 75 years vs. >75 years), gender (male vs. female), family history, smoking habit, consuming salty foods habit, consuming saturated fatty foods habit, consuming wasted cooking oil habit, alcoholic habit, doing physical activity, obesity, stress, and use of contraceptive before menopause. Collected data that has been processed then analyzed using SPSS program to conducted univariate analysis by descriptive test, bivariate analysis by chi square test, and multivariate analysis by multiple logistic regression.

Ethical Considerations

This study was approved by the Committee of Ethics in Research of the Public Health Science Faculty, University of Respati Indonesia kl,(No. 018/SK.KEPK/UNR/IV/2020). Ensure the confidentiality of the information, the databases were kept under the custody of the principal investigator, as stated in the terms of commitment to use databases and medical records. The databases of medical records and notification sheets were password protected and used exclusively in this study.

IV. FINDINGS

Table 1 shows the distribution of hypertension among elderly in South Tangerang, Banten, Indonesia. From the analyzed variables, there were significant association between age (p value = 0,034, OR = 3,361), family history (p value = 0,000, OR =0,074), consuming salty foods habit (p value = 0,007, OR = 2,292), consuming saturated fatty foods habit (p value = 0,008, OR = 2,284), physical activity (p value = 0,000, OR = 0,073), stress (p value = 0,000, OR = 2,547), and use of contraceptive before menopause (p value = 0,034, OR = 2,547) with the incident of hypertension in elderly in South Tangerang.

Table 1.Distribution of the Characteristics of Cases and Controls

Variables	Hypertension				Total		OR (95%CI)	p-value
	Cases		Controls		n	%		
	n	%	n	%				
Age								
60 – 75 years	83	84,7	93	94,9	176	89,8	3,361	0,034
>75 years	15	15,3	5	5,1	20	10,2	(1,171 – 9,649)	
Gender								
Male	51	52,0	42	42,9	93	47,4	0,691	0,252
Female	47	48,0	56	57,1	103	52,6	(0,394 – 1,214)	
Family History								
Yes	48	49,0	91	92,9	139	29,1	0,074	0,000
No	50	51,0	7	7,1	57	70,9	(0,031 – 0,175)	
Smoking Habit								
Yes	39	39,8	26	26,5	65	33,2	1,831	0,068
No	59	60,2	72	73,5	131	66,8	(1,001 – 3,348)	
Consuming Salty Foods Habit								
Yes	61	62,2	41	41,8	102	52,0	2,292	0,007
No	37	37,8	57	58,2	94	48,0	(1,293 – 4,064)	
Consuming Saturated Fatty Foods Habit								
Yes	69	70,4	50	51,0	119	60,7	2,284	0,008
No	29	29,6	48	49,0	77	39,3	(1,270 – 4,110)	
Consuming Wasted Cooking Oil Habit								
Yes	12	12,2	4	4,1	16	8,2	3,279	0,068
No	86	87,8	94	95,9	180	91,8	(1,019 – 10,552)	
Alcoholic Habit								
Yes	9	9,2	7	7,1	16	8,2	1,315	0,794
No	89	90,8	91	92,9	180	91,8	(0,469 – 3,682)	
Physical Activity								
Yes	4	4,1	36	36,7	40	20,4	0,073	0,000
No	94	95,9	62	63,3	156	79,6	(0,025 – 0,216)	
Obesity								
Yes	17	17,3	9	9,2	26	13,3	2,075	0,140
No	81	82,7	89	90,8	170	86,7	(0,876 – 4,915)	
Stress								
Yes	43	56,1	9	9,2	52	26,5	0,129	0,000

No	55	43,9	89	90,8	144	73,5	(0,059 – 0,286)	
Use Of Contraceptive Before Menopause								
Yes	88	89,8	76	77,6	164	83,7	2,547	
No	10	10,2	22	22,4	32	16,3	(1,135 – 5,715)	0,034

Table 2 shows the results of multivariate analysis that obtained the highest Odd Ratio (OR) value were the variable use of contraception before menopause (OR = 3,149), meaning that the elderly who had used contraception before menopause had a 3,149 times higher chance of suffering from hypertension compared to the elderly who had never used contraception before menopause after controlling by family history variables, habit of consuming salty food, habit of consuming saturated fat, habit of physical activity, stress, and age. In other words, the variable contraceptive use is the determinant or variable that most influences the incidence of hypertension in the elderly.

Table 2. Multivariate Adjusted Odds Ratios (OR)

Variable	B	P value	OR	95% CI
Age	1,200	0,090	3,319	0,829 – 13,286
Family History	-2,397	0,000	0,091	0,034 – 0,240
Consuming Salty Foods Habit	0,909	0,029	2,481	1,097 – 5,610
Consuming Saturated Fatty Foods Habit	0,915	0,026	2,498	1,113 – 5,604
Physical Activity	-2,173	0,001	0,114	0,030 – 0,427
Stress	-2,009	0,000	0,134	0,051 – 0,355
Use of Contraceptive Before Menopause	1,147	0,042	3,149	1,045 – 9,493

The multivariate summary analysis model in table 3 shows the relationship between contraceptive use and hypertension after controlling for variable family history, eating salty foods, consuming saturated fat, physical activity, stress, and age, with the value of R square = 0,577, it means that the variable use of contraception can explain 57,7% variable hypertension. And there were (100,0% - 57,7% = 42,3%) 42,3% variables or other factors that were not studied to explain the hypertension variable in the elderly at the South Tangerang, Banten, Indonesia.

Table 3. Model Summary of Multivariate Analysis

Variable	R ²
Hypertension	0,577

V. DISCUSSION

Lionakis, et al (2012) stated that hypertension is an important risk factor for cardiovascular morbidity and mortality, especially in the elderly. In fact, hypertension treatment is needed to reduce the incidence of cognitive impairment and dementia in the elderly.²⁴ This proves that as people get older, blood pressure will also increase. The artery walls will experience thickening caused by the buildup of collagen substances in the muscle layer, causing the blood vessels to narrow and become stiff after the age of 40 years. This statement is also supported by research conducted by Tular, et al. (2017) in Tarabita Village, West Likupang District, North Minahasa Regency, which shows that most respondents aged ≥ 40 years experience hypertension.²⁵

People with a family history had hypertension more frequently and were at risk for developing hypertension. Having a close family history of hypertension (heredity) can increase the risk of developing hypertension, especially in primary hypertension. In one family, if there were family members who had hypertension and heart disease, the risk of hypertension increases 2-5 times.²⁶ Liu, et al. (2015) stated that there was a strong and independent relationship between the risk category of family history and hypertension in the population of the Chinese elderly community living in rural Beijing. It also proves that family history was more closely related to the risk of developing hypertension in women than in men. Screening and early prevention of hypertension should consider not only positive or negative but also family history risk categories for the incidence of hypertension.²⁷

Hypertension is almost never found in ethnic groups with minimal salt intake. Salt intake of less than 3 grams per day causes a low prevalence of hypertension, whereas if salt intake is between 5-15 grams per day the prevalence of hypertension increases to 15-20%. The effect of intake on the emergence of hypertension occurs through an

increase in plasma volume, cardiac output and blood pressure.²⁸ The main consequences of high blood pressure are strokes, heart attacks and heart failure. It is a common cause of death and disability in the UK, and the risk increases with age. Reducing salt intake by 6g per day is estimated to reduce stroke by 24% and CHD by 18%. Research has shown that reducing salt intake in food has a positive impact.²⁹ Situngkir, et al (2019) stated that consumption of saturated fat also increases the risk of atherosclerosis which is associated with an increase in blood pressure. The habit of consuming saturated fat (> 3 times per week) was proven to be a risk factor for hypertension ($p = 0.022$). Saturated fat (found in butter, cakes, pastries, biscuits, meat products, and cream) has been shown to increase blood cholesterol levels.³⁰

Lack of exercise and physical activity also increases the risk of suffering from hypertension because it increases the risk of being overweight. In addition, people who are inactive also tend to have a higher heart rate, so the heart muscle has to work harder with each contraction. The harder and often the heart muscle has to pump, the more pressure is placed on the arteries.³¹ This is in line with a study conducted by Gandasentana, et al. (2011) which found the prevalence of hypertension in the elderly was 18.6%, while 67.1% of the subjects were less physically active. The risk of hypertension among physically active parents was 0.4 lower than among older people who were less physically active. In the economic evaluation the physically active group was higher in saving annual health care costs by around 60%.³²

Kumar, et al (2020) who provide an understanding of the current mental health situation and factors that influence stress, such as alcohol consumption and disease in elderly communities living in rural Thailand. The main factors that can cause non-communicable diseases such as hypertension, diabetes and other musculoskeletal disorders are stress and anxiety, this also applies to the opposite, where non-communicable disease disorders can also develop stress and anxiety.³³ Stress and hypertension are related through sympathetic nerve activity, which can gradually increase blood pressure. If the stress continues continuously, it can result in high blood pressure. This has not been proven with certainty, but in experimental animals given exposure to stress, it turned out that these animals became hypertension³⁴. Stress is defined as a physiological and psychological reaction to certain events in the environment. Some people define stress as an event or situation that causes them to feel tension, pressure or negative emotions, such as anxiety and anger. Stress is the unpleasant emotional and physiological state that people experience in situations they perceive as dangerous or threaten their well-being.³⁵

The results of multivariate analysis showed that the most influencing variable on the incidence of hypertension in the elderly was the use of contraception with an OR value of 3.149, which means that the elderly who used contraception before menopause had a 3.149 times higher chance of suffering from hypertension compared to elderly people who did not use contraception before menopause after controlling for the history variable. family, habits of eating salty foods, habits of consuming saturated fats, habits of physical activity, stress, and age.

The results of this study are in line with a meta-analysis study conducted by Liu, et al. (2017) which states that there is a significant relationship between the use of hormonal contraceptives and the incidence of hypertension in women, especially women who use pill contraception. The use of pill contraceptives in this study increased the risk of hypertension compared with the use of other types of contraceptives with a 13% increase in the risk of hypertension.³⁶ The use of hormonal contraceptives containing the hormones estrogen and progesterone can cause an increase in blood pressure. This is due to the occurrence of cardiac hypertrophy and an increase in response to pressure pressure II by involving the Renin Angiotensin System pathway.³⁷

This study is also in line with the findings of Pradani, et al. (2018) who conducted a study on women who had menopause in Surakarta. Their findings suggest that a history of use of hormonal contraceptives in postmenopausal women is 10 times more likely to suffer from hypertension than those who do not use hormonal contraceptives.³⁸ In a population-based study of Korean women aged 35-55 years, long-term use of oral contraceptives is associated with increased stress, systolic blood and diastolic blood pressure. In addition, the likelihood of hypertension or prehypertension was significantly increased among women using oral contraceptives for more than 2 years compared with non-users.³⁹

VI. CONCLUSIONS

Variable of contraceptive use is the determinant risk factor in the incidence of hypertension in elderly after controlling by family history variables, habit of consuming salty food, habit of consuming saturated fat, habit of physical activity, stress, and age. By that results, women of childbearing age in Indonesia especially South Tangerang should use contraceptives that do not affect hormones, including IUD (Intra Uterine Device)

contraception and condoms. Besides, the elderly can improve their health through a healthy diet and lifestyle to avoid non-communicable diseases caused by human behavior and degenerative factors.

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