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ORIGINAL ARTICLE

Polyclinic Geriatrics, Rumah Sakit Haji Medan, Risk Factors for Isolated Systolic Hypertension in the Elderly

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Abstract: Hypertension is a manifestation of hemodynamic balance disorders of the cardiovascular system. Isolated systolic hypertension is defined as a systolic blood pressure ≥ 140 mmHg and a diastolic blood pressure ≤ 90 mmHg. This study aims to analyze the influence of family history, obesity, smoking, physical activity, and salt and fat consumption on the incidence of isolated systolic hypertension in the elderly at the Geriatric Polyclinic of Rumah Sakit Haji Medan. The design of this study is an observational analytical study approach to a case control study using questionnaires from patients at the Geriatric Polyclinic of Rumah Sakit Haji Medan. The sampling technique uses purposive sampling. From 90 samples, it was found that there was an influence of family history (*P*-value=0.003; OR =3.62; CI 95% = 1.05–8.65), smoking (*P*-value=0.035; OR =2.47; CI 95% = 1.05–5.76), physical activity (*P*-value=0.010; OR =3.07; CI 95% = 1.28–7.36), and salt and fat consumption (*P*-value=0.033; OR =2.53; CI 95% = 1.07–5.98), and there was no effect of obesity on the incidence of isolated systolic hypertension (*P*-value=0.827; OR =1.10; CI 95% = 0.46-2.59). The results of the multivariate analysis showed that the most dominant variable influencing the incidence of isolated systolic hypertension was family history (*P*-value = 0.023; Exp β =0.347). There is an influence of family history, smoking, physical activity, and salt and fat consumption on the incidence of isolated systolic hypertension in the elderly, but there is no influence of obesity on the incidence of isolated systolic hypertension in the elderly. The most dominant variable influencing the incidence of isolated systolic hypertension in the elderly is family history.

Keywords: Elderly, Isolated Systolic Hypertension, Risk Factors

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INTRODUCTION

Hypertension is a manifestation of impaired hemodynamic balance in the cardiovascular system. Hypertension is often a common disease found in people in primary health facilities. As per the guidelines of the European Society of Cardiology/European Society of Hypertension 2018 (ESC-ESH 2018) and the World Health Organization/International Society of Hypertension 1999/2003 (WHO/ISH 1999/2003), isolated systolic hypertension (HST) is defined as systolic blood pressure ≥ 140 mmHg and diastolic blood pressure ≤ 90 mmHg.[1] The incidence of isolated systolic hypertension increases with age.[1] This occurs due to arterial stiffness and early reflection of carotid artery waves.[2] According to the Data Report of the Indonesian Central Statistics Agency in 2019, shows that the percentage of people over 65 years of age will increase by 25% in 2050. In the data, it is stated that around 25 million people in 2019, will increase to 80 million people by 2050.[3] The growth of the elderly population poses challenges for the healthcare system to meet the needs of the elderly, who require large resources. Specifically, cardiovascular disease is a major cause of national health spending due to the growing elderly population.[4] Therefore, good diagnosis and intervention are needed to address this problem. At least 1 billion people suffer from hypertension, and it is estimated that around 1.5 billion (29.2%) adults worldwide will suffer from hypertension by 2025.[5] including 17.3% of people in developing countries.[6] The prevalence of hypertension in the Southeast Asian region is 37%.[7] As for the prevalence of hypertension in Indonesia, it tends to increase from 25.8 per 100,000 population in 2013 to 34.1 per 100,000 population in 2018. The prevalence of hypertension in North Sumatra Province tends to increase from 24.7% in 2013 to 30% in 2018.[8] Likewise, in Medan City, the prevalence of hypertension is still high, with 22.53% of the population experiencing hypertension in 2017.[8] According to Medan City Health Data in 2017, it shows the prevalence of hypertension in Medan Selayang District, which is 27.73%. This prevalence is in second place in the district with the highest prevalence of hypertension in Medan City after Medan Baru District, which is 28.43%.[9] As for the data on the prevalence of isolated systolic hypertension found in a study in Vietnam, it was obtained at 22.88%. [10] According to a survey conducted by the National Health and Nutrition Examination Survey from 1999–2010, the results of isolated systolic hypertension occurred at 29.4% at the age of ≥60 years.[11] In addition, it was also found that the prevalence of isolated systolic hypertension

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was successively 7%, 11%, 18%, and 25% in the age groups of 60–69, 70–79, 80–89, and over 90 years. Isolated systolic hypertension is more common in women than in men.[11] The process of the occurrence of isolated systolic hypertension in elderly patients due to a reduction in arterial elasticity or the occurrence of the atherosclerosis process, especially in large arteries, results in higher systolic pressure and lower diastolic pressure or an increase in pulse pressure.[12] Age, gender, family history, obesity, smoking, physical activity, and salt and fat consumption are some of the risk factors that can cause isolated systolic hypertension. The incidence of isolated systolic hypertension generally occurs in old age as well as affected by physical activity. People who live a lifestyle of not actively doing physical activity will be more susceptible to this disease. In addition, obesity is a factor that can increase the risk of hypertension due to excess body fat. Another factor is smoking habits that cause toxic chemicals such as nicotine and carbon monoxide to enter the bloodstream, which can damage the endothelial layer of arterial blood vessels.[13] Salt consumption can also cause hypertension due to the retention of sodium so that there is an increase in fluid volume and preload and will eventually increase cardiac output, while fat consumption will result in atherosclerosis in blood vessels.[14] Isolated cases of systolic hypertension can cause cardiovascular complications, namely sudden cardiac death, abdominal aortic aneurysm, angina pectoris, left ventricular hypertrophy, chronic kidney disease, atrial fibrillation, diabetes mellitus, metabolic syndrome, vascular dementia, Alzheimer's disease, and ophthalmological diseases.[15] To prevent complications from the disease, it is necessary to control risk factors for isolated systolic hypertension. Based on the description above, it is necessary to conduct research on the risk factors for isolated systolic hypertension in the elderly at the Geriatric Polyclinic of Rumah Sakit Haji Medan.

METHOD

This study is an observational analytical study approach using questionnaires from patients at the Geriatric Polyclinic of Rumah Sakit Haji Medan. The sampling technique uses purposive sampling. This research will be conducted at the Geriatric Polyclinic of Rumah Sakit Haji Medan. The population of this study was all elderly patients ≥ 60 years old at the Geriatric Polyclinic of Rumah Sakit Haji Medan. The case group was all elderly with isolated systolic hypertension, and the control group was elderly who did not suffer from isolated systolic hypertension.

The samples in this study were all patients who included inclusion criteria and exclusion criteria at the Geriatric Polyclinic of Rumah Sakit Haji Medan. The inclusion

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Characteristic	Case		Control	
	n	%	n	%
Age (years)				
60-69	34	75,6	34	75,6
>70	11	24,4	11	24,4
Gender				
Man	25	55,6	25	55,6
Woman	20	44,4	20	44,4
Education				
SD	3	6,7	3	6,7
JUNIOR	9	20	6	13,3
SMA	21	46,7	25	55,6
College	12	26,7	11	24,4
Work				
Farmer	1	2,2	5	11,1
Housewives	13	28,9	14	31,1
Pensioner	17	37,8	12	26,7
Merchant	14	31,1	13	28,9
Civil Servants	0	0	1	2,2

and exclusion criteria in this study were for the inclusion criteria in this study, namely patients aged ≥ 60 years, patients with isolated systolic hypertension, and patients who were willing to sign informed consent, and for the exclusion criteria, namely patients who were uncooperative for several reasons. The total sample in this study was 90 respondents, consisting of 45 case groups and 45 control groups. The data collection technique in this study is a questionnaire that has been validated before.

The hypothesis of this study was tested with a bivariate test using the Chi-Square Test with a *P*-value of <0.05. To determine the relationship of isolated systolic hypertension risk factors in the elderly using a multivariate test analysis, namely multiple logistic regression.

RESULT

As for the results of statistical tests, the following research results were obtained:

Table 1. Distribution By Characteristics of Respondents

Based on table 1 above, it shows that matching has been carried out for age and gender in the case and control groups so that the proportions are the same. Most of the case and control subjects had an average of 21 cases (46.7%) and 25 people (55.6%), and most of the elderly were retirees, namely 17 cases (37.8%) and 12 people (26.7%).

Table 2. Distribution of Family History, Obesity, Smoking, Physical Activities and Salt and Fat Consumption

Status	Case		Control	
	n	%	n	%
Family History				
Yes	30	66,7	16	35,6
Not	15	33,3	29	64,4
Obesity				
Yes	17	37,8	16	35,6
Not	28	62,2	29	64,4
Smoke				
Yes	28	62,2	18	40
Not	17	37,8	27	60
Physical Activity				
Less	32	71,1	20	44,4
Good	13	28,9	25	55,6
Salt and Fat Consumption				
Often	31	68,9	21	46,7
Infrequently	14	31,1	24	53,3

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According to the findings in table 2, the proportion of the elderly with a family history of hypertension in more cases is 30 people (66.7%), the proportion of obese elderly cases and controls, namely more people who are not obese, is as many as 29 people (64.4%), and the proportion of elderly people with smoking habits between cases and controls, namely in cases where there was less physical activity, is 32 people (71.1%). Similarly, in the variables of salt and fat consumption for each case and control, namely in the case of more frequent consumption of 31 people (68.9%),

Variable	Case		Control		*p*	OR
	n	%	n	%		95% CI
Family History						
Yes	30	66,7	16	35,6	0,003	3,62
Not	15	33,3	29	64,4		(1,51-8,65)
Obesity						
Yes	17	37,8	16	35,6	0,827	1,10
Not	28	62,2	29	64,4		(0,46-2,59)
Smoke						
Yes	28	62,2	18	40	0,035	2,47
Not	17	37,8	27	60		(1,05-5,76)
Physical Activity						
Less	32	71,1	20	44,4	0,010	3,07
Good	13	28,9	25	55,6		(1,28-7,36)
Salt and Fat Consumption						
Often	31	68,9	21	46,7	0,033	2,53
Infrequently	14	31,1	24	53,3		(1,07-5,98)

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Salt and Fat Consumption	0,339	0,609	0,22-1,683

Table 3. Effect of Family History, Obesity, Smoking, Physical Activity and Salt and Fat Consumption on the Incidence of HST in the Elderly

Based on table 3 above, it shows the results of bivariate tests on independent variables found the influence of family history variables, (*P*-value = 0.003; OR = 3.62; CI 95% = 1.05–8.65), smoked (*P*-value = 0.035; OR = 2.47; CI 95% = 1.05–5.76), physical activity (*P*-value = 0.10, OR=3.07; CI 95%=1.28-7.36), as well as salt and fat consumption (*P*-value=0.33; OR=2.53; CI 95% = 1.07–5.98) on the incidence of isolated hypertension in the elderly and there was no effect of obesity on the incidence of isolated systolic hypertension (*P*-value = 0.827; OR = 1.10; CI 95% = 0.46-2.59).

Table 4. Analysis of the Risk Factors Most Influential on HST Events

Variable	Sig.	Exp(β)	95% CI
Family History	0,023	0,347	0,14-0,864
Smoke	0,492	0,703	0,257-1,92
Physical Activity	0,082	0,439	0,174-1,109

Based on the results of the multivariate analysis in table 4 above, it is known that from the four variables, 1 variable was obtained that most affected the incidence of isolated systolic hypertension in the elderly, namely the family history variable. Family history variable with *P*-value = 0.023 where <0.05 which means that H0 is rejected, which means there is an influence of family history on the incidence of isolated systolic hypertension in the elderly at the Geriatric Polyclinic of Rumah Sakit Haji Medan. After further analysis, a strong influence value (β) of behavior was obtained by 0.347, which means that the more respondents who have a family history of eating, the higher the risk for isolated systolic hypertension in the elderly by 34.7%.

DISCUSSION

In this study, it was found that family history is a factor that influences the incidence of HST, with a risk of 3.62 times greater than the elderly who do not have a family history. The results of the multivariate test analysis showed a *P*-value = 0.023, which means that family history is the variable that has the most significant effect on the incidence of HST in the elderly at the Geriatric Polyclinic of Rumah

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Sakit Haji Medan. The results of this study are in line with research conducted by Ricca (2018) which shows a significant influence between family history and the incidence of hypertension in the elderly. In those who have a family history of hypertension, the risk is 7,730 times greater than the incidence of hypertension in the elderly who do not have a family history.[16]

Family history is a representative of gene variations, behaviors, and a shared environment where this genetic factor is related to the incidence of hypertension. As for the family history considered in this study, it is close family members such as both parents as well as siblings. If many of these family members have a history of hypertension, then the person also has a greater chance of being affected. This is in accordance with a study conducted by Miao Liu (2015) in China, which mentioned that a person who has a family history of hypertension can have a 2-4 times greater risk of developing hypertension. [17]

In this study, it was found that obesity did not have a significant influence on the incidence of HST. This is in line with research conducted by Lewa et al. (2010) where it showed a meaningless influence. The results of the analysis obtained an OR value of 1.245 with a CI of 95%=0.496-3.124 and *P*-value = 0.815.[18] In this study, obesity had no effect on HST. This was because, both in the group of cases who experienced HST and in the control group who experienced HST, obesity status was not found by the majority of the two groups. This is supported by data from Riskesdas (2018) in Indonesia showing that for the thin category of the elderly, there was an increase according to their age, namely the age of 60-64 years (11.7%), and the age of >65 years (20.7%), compared to the age of 55-59 years on average by 8.3%. On the other hand, for the obesity category, there was a decrease in accordance with the increase in age, namely at the age of 60-64 years (19.3%) and at the age of >65 years (11.9%) compared to the age of 55-59 years on average of 23.1%. [19]

Based on these data, this is due to a physiological decrease that occurs in the gastrointestinal system in old age, causing a decrease in food absorption in the small intestine as well as a decrease in intestinal motility. With this, people with old age will also experience a decrease in appetite and the amount of food consumed due to certain conditions both physiological and pathological in the body that cause weight loss. In addition, things that can happen include a decrease in strength and muscle mass that occurs in old age due to weight loss. [20] However, this study is not in line with the research conducted by Noerinta (2018), which found that the results of a bivariate analysis between obesity variables and the incidence of hypertension in the elderly showed a meaningful influence, that obesity has a risk of 2,641 times the

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incidence of hypertension compared to those who are not obese. [21]

In this study, it was found that smoking is a factor that affects the incidence of HST, with a risk of 2.47 times greater than those who do not have a smoking habit. The results of this study are in line with previous research conducted by Maisarah (2019), where it was found that as many as 58.3% of smoking habits were found to be associated with the incidence of hypertension in the elderly. [22]

The results of this study are also in line with previous studies conducted by Arlianti et al. (2019), which stated that there was a significant value between the influence of smoking habits on hypertension in the elderly with *P*-value = 0.001. In addition to that, the study also showed that respondents who had smoking habits had a risk or chance of suffering from hypertension of 4,991 compared to respondents who did not have the habit of smoking. [23]

Smoking is one of the factors that causes an increase in blood pressure. [24]. Cigarettes contain various harmful chemicals such as nicotine and carbon monoxide so that if the substance is sucked in and enters the bloodstream and enters small blood vessels in the lungs and then circulates to the brain, it will cause narrowing of blood vessels, as well as damage to the endothelial layer of arterial blood vessels and can accelerate the occurrence of atherosclerosis. [25]. Smokers may increase the incidence of malignant hypertension and the risk of renal artery stenosis due to atherosclerosis. [18].

In this study, it was found that insufficient physical activity was a factor that influenced the incidence of HST, with a risk of 3.07 times compared to the elderly who had good physical activity. This research is in line with the research conducted by Norma (2020) that found a relationship between physical activity and the incidence of hypertension in the elderly, with the value of the correlation coefficient obtained being -0.324, which shows that the relationship between the two variables is quite strong. [26].

In addition, this study is also in line with research conducted by Budi (2014) that found physical activity has an influence on the incidence of HST in the elderly. In this study, an Exp B value of 1.97 was obtained, where the elderly who suffered from HST were 1.97 times more likely not to do physical activity compared to the elderly who did not suffer from HST. [27]. Physical activity is the movement of limbs that can cause energy expenditure for the maintenance of physical and mental health, as well as maintaining the quality of life to stay healthy and fit throughout the day. Physical activity plays a very important role, especially for people of advanced age.

In this study, it was found that the consumption of salt and fat is often a factor

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that influences the incidence of HST, with a risk of 2.53 times compared to those who rarely consume salt and fat. The results of this study are in line with Ricca (2018), which shows that people who consume high fat are at 2,333 times the chance of developing hypertension compared to people who consume enough fat.[16] In addition, the results in this study are in line with previous research conducted by Jaya et al. (2016) showing that consuming excessive salty foods is a risk factor for hypertension events, where a person suffering from hypertension has 3.08 times the tendency to consume salty foods frequently. [28]. Another study conducted by Budi (2014) also showed that there is a meaningful influence between salt consumption and the incidence of HST, where salt consumption has a risk of 2 times the probability of experiencing HST in the elderly. [27]

Excessive salt consumption or the large amount of sodium content in foods in the community is one of the risk factors for the occurrence of HST in the elderly. This is because the high consumption of sodium will be absorbed into the blood vessels and will result in water retention, resulting in increased blood volume. This can cause an increase in blood pressure. 29. Consumption of foods that contain high fat can also increase cholesterol levels in the blood, so that it can narrow the arteries and block blood circulation. Excessive feeding can lead to obesity due to the accumulation of fat. The habit of consuming these fats can lead to an increase in body weight, which is at risk of an increase in blood pressure. [29]

CONCLUSION

Based on the findings of the study, it is possible to conclude that family history, smoking, physical activity, and salt and fat consumption all have an impact on the incidence of isolated systolic hypertension in the elderly. Obesity has no impact on the incidence of isolated systolic hypertension in the elderly.

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