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RELATIONSHIP OF COMORBID DISEASE WITH THE INCIDENCE OF STROKE IN THE ELDERLY GROUP

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Abstract

Stroke has become a degenerative disease that accounts for 74% of deaths worldwide. According to Riskesdas data for 2018, the prevalence of stroke in Indonesia increases significantly as patients age. Comorbid diseases such as hypertension, diabetes mellitus, heart disease, and other diseases increase the risk of stroke. The location of this research is in the North Sulawesi Province, conducted from April to July 2023. The research uses national-scale surveys with a quantitative approach and cross-sectional studies. The population in this study is 7.850 respondents, and after cleaning the data, we used samples of 5.540 respondents. This research aims to analyze the relationship between comorbid conditions and the occurrence of stroke in the elderly population at North Sulawesi Province. The results show that hypertension, diabetes, and heart disease have a meaningful relationship with stroke incidence,however there is no significant correlation between the incidence of stroke and obesity in the elderly group in the Northern Sulawesi Province. Therefore, it is recommend the elderly to adopt a healthy lifestyle and undergo routine medical examinations to avoid the risk of stroke.
Keyword: Diabetes, hypertension, heart disease, obesity, stroke

INTRODUCTION

It is globally known that 7 out of the 10 leading causes of death in 2019 are non-communicable diseases. These seven non-communicable diseases account for 74% of global deaths, one of which is stroke (WHO, 2020). Stroke occurs when the blood flow to the brain is disrupt or block, resulting in a lack of oxygen supply, brain damage and loss of brain function. Stroke is most often caused by a blockage in the artery that carries blood to the cerebellum, but it can also be due to damage to the blood vessels in the brain that leads to bleeding. The impact of a stroke can be permanent damage, such as defects in parts of the body and disorders in speaking, understanding, and remembering. The type and severity of the disorder are affected by the affected parts of the brain and how long the blood supply is stopped (World Stroke Organization, 2023).

According to the Global Burden of Disease Study 2019 data published by the Institute for Health Metrics and Evaluation (IHME), the prevalence of stroke worldwide has increased from 1990 to 2019. In 2019, it is estimated that there are about 101 million people living with strokes worldwide, and the disease is among the non-communicable diseases that are the largest cause of death in the world, with approximately 6.5 million deaths by 2019 (Feigin *et al.*, 2021).

According to National Basic Health Survey/ Riset Kesehatan Dasar (Riskesdas) for 2018, the prevalence of stroke in Indonesia increases significantly as patients age. A striking increase occurred in the age group of 55–64 years, rising from 14,2% in the 45–54 year olds to 32,4‰. This figure continues to rise in the 65-74 year-old age group, reaching 45,3‰, and continues to increase in the ≥ 75 year-old age group to 50,2‰. Therefore, it can be concluded that the majority of stroke cases in Indonesia are

experienced by the older age group (Kemenkes RI, 2019).

According to National Basic Health Survey/ Riset Kesehatan Dasar (Riskesdas) for 2013, the prevalence of stroke occurrences based on diagnosis of health care in the North Sulawesi Province is 10,8‰ and is the province with the highest incidence of stroke in Indonesia. Whereas in the 2018 Riskesdas data, the prevalence of strokes based on the diagnostics of doctors and health care workers has increased to 14,2‰ and becomes the province with the third-highest prevalence in Indonesia after East Kalimantan (14,7‰) and D.I Yogyakarta (Kemenkes RI, 2019)**.**

Comorbidity is a concomitant disease that is common in the elderly age group with reduced immunity. A comorbid disease refers to an additional medical condition that a person has in addition to the primary disease or health condition that he or she is experiencing. Comorbid diseases can affect the prognosis, treatment, and management of major diseases and increase the risk of complications or death (Wasityastuti, Dhamarjati and Siswanto, 2020).

Hypertension is a major trigger for stroke, whether hemorrhagic or ischemic (Waluyo, 2009). In ischemic stroke, hypertension causes the damage of cells in the inner layer of the arteries, thus becoming the place where the fat accumulates in the bloodstream. In hemorrhagic strokes, it occurs because of chronic high blood pressure or vascular aging, so that the blood continues to press the vessel until it is no longer strong enough to hold it and break (American Stroke Association, 2018).

Diabetes melitus can thicken the walls of the large blood vessels in the brain. Thickening the blood vessel will narrow the diameter of the cerebral vessel, and the narrowing will then interfere with the smooth flow of blood to the brain, which eventually leads to the infarction of brain cells. Many people with diabetes also have high blood pressure, high blood cholesterol, and are overweight. It increases the risk of stroke. (Hutagalung, 2019).

Heart disease and stroke have a close relationship. A disorder in the heart causes blood pumping to other parts of the body, including the brain, to become abnormal. From this, we can understand the close relationship between heart disease and stroke (Kusyani and Khayudin, 2022).

Based on the background and problems above, it can be known that accompanying diseases (comorbid) have a close connection with the occurrence of stroke disease. The author is interested in conducting this research because there has been no prior study on the relationship between comorbid conditions and stroke in North Sulawesi Province. The aim of the study is to analyze the relationship between diabetes, hypertension, heart disease and obesity with the incidence of stroke in the elderly in the North Sulawesi Province using secondary data from National Basic Health Survey in 2018.

RESEARCH METHOD

This study used national-scale surveys with a quantitative approach and cross-sectional studies. A cross-sectional study is a research project that analyzes the relationship between cause-and-effect factors using various approaches, such as observation or data collection, at the same time (Notoatmodjo, 2018). The study use further secondary data analysis from National Basic Health Survey/ Riset Kesehatan Dasar (Riskesdas) 2018. The population in this study is the entire population in the North Sulawesi Province in the age group (≥46 years) that is registered with the Central Statistical Agency/ Badan Pusat Statistik (BPS), which is as many as 7.850 people. The sample used in this research is the total sampling of all individuals that are registered with Central Statistical Agency/ Badan Pusat Statistik (BPS) of the North Sulawesi province and selected in the Block Census (BS). After the process of data cleaning, it was found that the number of samples in the study was as high as 5.540 samples.

The independent variable in this study is stroke. Meanwhile, the dependent variables include hypertension, diabetes mellitus, heart disease and obesity, which were obtained through direct interviews with respondents based on doctor or healthcare professional diagnoses from the 2018 National Basic Health Research/ Riset Kesehatan Dasar (Riskesdas). Hypertension is the result of blood pressure measurement being 140/90 mmHg or higher, and it is considered not hypertensive if it is below this figure. Diabetes mellitus is characterized by elevated blood sugar levels (≥200 mg/dL) after a 2-hour loading test. Someone is considered to have heart disease after being correctly diagnosed by a doctor. Obesity is a condition characterized by a high body fat mass, calculated using the body mass index by dividing body

weight (kg) by height (m^2), with results exceeding >27 kg/m^2.

Data analysis uses descriptive univariate analysis to determine the frequency of each variable and chi-square bivariate test to find out the relationship between the variables dependent and stroke. This study uses secondary data from the Health Policy and Development Agency/ Badan Kebijakan dan Pembangunan Kesehatan (BKPK), which is the result of the 2018 National Basic Health Survey in the Northern Sulawesi Province. Data collection using questionnaire instruments with interview technique.

RESULTS AND DISCUSSIONS

Table 1 above shows that based on the analysis of Riskesdas data carried out in 2018 in Northern Sulawesi Province, the percentage of stroke incidence in the older age group was 3,6%. The majority of respondents were at the early age category (45 to 65 years), that is, 2.525 people (45,6%), and more female than male, that is, 3.068 people (55,4%). Most respondents, 5,112 people (92,3%) had no diabetes mellitus, while 428 people (7,7%) had it. Most respondents had no history of heart disease, which was 5,295 people (95,6%), while those with heart disease were 245 people (4,4%), the majority were non-obese 3.660 people (66,1%), and those with obesity were 1,880 (33,9%).

Table 1. Frequency Distribution of Respondent Characteristic

Variable	Frequency	Percentage (%)
Stroke		
Yes	198	3,6
No	5.342	96,4
Age		
46-55 years old	2.525	45,6
56-65 years old	1.795	32,4
>65 years old	1.220	22,0
Gender Type		
Male	2.472	44,6
Female	3.068	55,4
Hypertenssion		
Yes	2.128	38,4
No	3.412	61,6
Diabetes Mellitus		
Yes	428	7,7
No	5.112	92,3
Heart Disease		
Yes	245	4,4
No	5.295	95,6
Obesity		
Yes	1.880	33,9
No	3.660	66,1
Total	**5.540**	**100,0**

In table 2 , it can be seen that the proportion of respondents experiencing hypertension with stroke incidence in the elderly group in North Sulawesi Province is 160 (2,9%). We obtained a p-value of 0.000 (<α 0.05%), which indicates that there is a significant relationship between hypertension and stroke. According to the statistical study, respondents who suffer from hypertension have a 7.2 times higher risk of stroke than those who do not have hypertension (95% CI = 5.046-10.326).

The proportion of respondents who did not have diabetes mellitus with stroke incidence in the elderly group in North Sulawesi Province was 166 (3%). We obtained a p-value of 0.000 (<α 0.05%), which indicates that there is a significant relationship between diabetes mellitus and the incidence of stroke. According to the statistical study, respondents who suffer from diabetes mellitus have a 2.4 times higher risk of stroke than those who do not have diabetes (95% CI = 1,627–3,563). The proportion of non-heart disease respondents with stroke incidence in the elderly group in Sulawesi Province was 173 (3.1%). The p-value of 0.000 (<α 0.05%) indicates that there is a significant relationship between heart disease and stroke. According to the statistical study, respondents with diabetes mellitus were 3.4 times more likely to develop stroke than those who did not have diabetes (95% CI = 2,168–5,227).

The proportion of non-obese respondents with stroke incidence in the elderly group in the province of Sulawesi was 133 (2.4%). Given a p-value of 0.000 (>α 0.05%), the value indicates that there is no significant relationship between obesity and stroke.

Table 2. Bivariat Analysis of Hypertension, Diabetes Mellitus, Heart Disease and Obesity with the Incidence of Stroke in the Elderly group in North Sulawesi Province

Variable	Stroke				Total		OR (95% CI)	*p-value*
	Yes		No					
	n	%	n	%	n	%		
Hypertension								
Yes	160	2,9	1.968	35,5	2.128	38,4	7,219 (5,046-10,326)	0,000*
No	38	0,7	3.374	60,9	3.412	61,6		
Total	**198**	**3,6**	**5.342**	**96,4**	**5.540**	**100,0**		
Diabetes Mellitus								
Yes	32	0,6	396	7,1	428	7,7	2,408 (1.627-3,563)	0,000*
No	166	3,0	4.946	89,3	5.112	92,3		
Total	**198**	**3,6**	**5.342**	**96,4**	**5.540**	**100,0**		
Heart Disease								
Yes	25	0,5	220	4,0	245	4,4	3,364 (2,168-5,227)	0,000*
No	173	3,1	5.122	92,5	5.295	95,6		
Total	**198**	**3,6**	**5.342**	**96,4**	**5.540**	**100,0**		
Obesity								
Yes	65	1,2	1.815	32,8	1.880	33,9	0,950 (0,702-1,285)	0,796
No	133	2,4	3.527	63,7	3.660	66,1		
Total	**198**	**3,6**	**5.342**	**96,4**	**5.540**	**100,0**		

Hypertension

Hypertension can be fatal if not well controlled, commonly called complications. In the brain, hypertension will cause quite fatal complications. According to research, most strokes are caused by hypertension (Hutagalung, 2021). The results of this study show that there is a significant relationship between hypertension and stroke incidence in the older age group in North Sulawesi Province. Respondents who suffered from hypertension were six times more likely to develop a stroke than those who did not. It is in line with research by Suntara et al. (2021) that there is a meaningful relationship between hypertension and stroke incidence in the elderly in the work area of the Community Health Center (Puskesmas) in the Tanjung Riau Subdistrict, Sekupang City (Suntara, Roza and Rahmah, 2021).

It is also consistent with the study of Azzahra and Ronoatmodjo (2022) that hypertension is the most dominant factor in the occurrence of strokes and has a 5.69 times higher chance of suffering a stroke compared to respondents who do not have hypertensive blood pressure (Azzahra and Ronoatmodjo, 2022). The same is true of the research by Wikananda et al. (2019), which found that hypertension is the most common risk factor found in stroke patients at Neurology Polyclinic, Sanglah General Hospital, Denpasar. There is a meaningful relationship between hypertension and stroke, and people who have high blood pressure have a 2.4-fold higher risk of stroke(Wikananda, Putra and Widiantara, 2019).

The people of North Sulawesi Province (Minahasa) are happy to socialize. If there's any activity, then they're trying to get involved. They often hold parties where smoking and drinking of alcoholic beverages, such as excessive Mouse Caps, and the presentation of foods that contain high saturated fats, such as processed pigs (Nelwan, 2020). Smoking habits, alcohol consumption, and eating foods high in fat and salt can cause atherosclerosis of the plaque. Hypertension that causes atherosklerosis of the plaque continuously will trigger the onset of stroke. Hypertension is a major trigger for stroke, whether hemorrhagic or ischemic (Waluyo, 2009).

Hemorrhagic stroke, caused by persistent hypertension or vascular aging, results in blood pressure continuously pushing into the blood vessels, resulting in a loss of elasticity in the arterial walls. As a result, blood flow throughout the body, including the brain, becomes restricted (American Stroke Association, 2018).

Diabetes Mellitus

Diabetes mellitus statistical test results obtained a p-value of 0,000 (<0.05%), meaning that there is a significant correlation between diabetes mellitus and the incidence of stroke in the older age group in the Northern Sulawesi Province. Respondents who suffered from diabetes mellitus were 2.4 times more likely to

develop stroke than those who did not suffer from diabetes. The results of this study are in line with the Azzahra & Ronoatmodjo study (2022) that stated that respondents with diabetic melitus had a significantly higher 2.44 times chance of having a stroke than respondents without diabetes melitus (Azzahra and Ronoatmodjo, 2022). Hisni et al (2022) found that almost all patients with ischemic stroke had diabetes mellitus at the Pluit Jakarta Northern Hospital Physiotherapy Facility. Patients with diabetes mellitus have a 5.44 times greater risk of developing ischemic stroke than patients without diabetes (Hisni, Evelianti Saputri and Sujarni, 2022).

Men and women who suffer from diabetes mellitus have a higher risk of developing ischemic stroke than those who do not. Diabetes mellitus (DM) is one of the most important risk factors for stroke. Approximately 30% of patients with cerebral atherosclerosis are proven to be DM and stroke incidence is twice as high in diabetics than in non-diabetics (Hutagalung, 2021). When a person reaches the age of 70, they start to experience a variety of health issues, including those involving their blood vessels, brain, kidneys, and even their heart. It is known, however, that the prevalence of diabetes among the elderly is rising. This is probably caused by the elderly population's decreased insulin sensitivity and laxer lifestyle. In truth, the pancreas of the elderly hasn't experienced much decline. Insulin resistance results from the fact that there is still enough insulin produced but that the body is becoming less able to use it (Waluyo, 2009)

Heart Disease

Coronary heart disease, rheumatic heart disease, and heart rhythm disorders are factors that potentially interfere with heart rate. This generally inhibits blood flow to the brain because the heart organ pumps frozen blood or dead tissue into the bloodstream (Hutagalung, 2019).

A p-value of 0.000 (<0.05%) was obtained, meaning that there is a significant correlation between heart disease and stroke incidence in the older age group in the Northern Sulawesi Province. Respondents who suffered from diabetes mellitus were 3.4 times more likely to develop a stroke than those who did not. The results of this study are in line with the Hisni et al. study (2022), which shows that there is a link between a history of heart disease and the incidence of ischemic stroke. The same is true of a study by Owolabi et al. (2018) that found that people with heart disease were 1.65 times more likely to have a stroke than people without a history of heart disease (Owolabi *et al.*, 2018).

If you've had a heart attack before, you're at higher risk of having a stroke. A heart attack occurs because of plaque buildup that causes blockage in the blood vessels to the heart. Similarly, most strokes are caused by plaques that block the blood vessels in the brain (Kariasa, 2022).

Obesity

Obesity statistical test results obtained a p-value of 0.000 (>α 0.05%), which indicates that there is no significant correlation between obesity and stroke incidence in the older age group in North Sulawesi Province. It is consistent with Elmukhsinur and Kusumarini (2021) that obesity is not related to the occurrence of strokes, but if seen from the OR value of the respondents who are obese, there is a risk of 1.379 to have a stroke when compared to the non-obese respondents (Elmukhsinur and Kusumarini, 2021). According to the Prayoga & Rasyid study (2022), there is a link between obesity and the occurrence of ischemic stroke. It was concluded that respondents experiencing obesity have a 2.4 times higher risk of suffering from an ischemic stroke compared to respondents without obesity (Prayoga and Rasyid, 2022).

The results of this study are actually opposed to the theory that there is a link between obesity and the occurrence of strokes. According to the researchers, this is due to a decrease in the number of samples in the study because there is missing or empty data on some of the risk-based 2018 variables obtained, so the data has to be removed, which causes the obesity variable that should be significantly related to become unrelated.

The strengthness of this research is that there has been no previous study examining the relationship between comorbid diseases and stroke in North Sulawesi Province, even though this province has a very concerning incidence of stroke. The sample used in this study is also substantial, effectively representing the population. However, a limitation of this research is the use of secondary data from 2018,

it would be more beneficial to utilize more recent data.

CONCLUSION AND SUGGESTION

Hypertension, diabetes mellitus, and heart disease had a meaningful relationship with the incidence of strokes, and obesity had no meaningful connection with the incidence of stroke in the elderly group in the Northern Sulawesi Province.

Older people must to monitor their blood pressure as hypertension is a primary factor in the occurrence of stroke. Blood pressure can be controlled by maintaining a healthy diet, engaging in regular exercise, and following the instructions provided by doctors or healthcare professionals.

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