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Early diagnosis of stroke risk factors in high school students in Makassar, South Sulawesi, Indonesia

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Abstract

The number of stroke patients in Indonesia is ranked as the first country to experience the most strokes in all of Asia. The prevalence of stroke in Indonesia reaches 8.3 out of 1000 population. This prevalence rate increases with increasing age. Indonesian national data shows that stroke is the highest cause of death, at 15.4%, with approximately 750,000 strokes per year in Indonesia and 200,000 recurrent strokes. People who are physically inactive (those who exercise less than three times per week, each for 30 minutes) have an almost 50% increased risk of stroke compared to those who are active. Physical inactivity can lead to weight problems and increased blood pressure and is associated with diabetes, all of which are important risk factors for stroke. Inactivity also contributes to the onset of early atherosclerosis and other cardiovascular diseases, such as heart attacks. This study is an analytical observational study with a cross sectional design to see and observe the risk factors for stroke that exist in school children in Makassar city. Data processing was carried out using computer application programs and SPSS version 22.0 with data analysis methods using the Chi Square Test with the Yate's Correlation formula in SPSS called Continuity Correction and Risk. The number of respondents studied was 896 people. Hypertension is a major risk factor for health problems in society, especially in socioeconomic transition. Hypertension is a primary risk factor for the onset of heart disease and stroke. Doing physical activity will prevent us from various diseases, by doing adequate physical activity we can suppress the increase in blood sugar levels, cholesterol levels, and avoid obesity and strengthen the heart. All of which are risk factors for stroke. So thus by doing adequate physical activity we can avoid stroke. There is a relationship between gender, obesity, hypertension, family history of disease, stress, physical activity, risky diet and smoking on stroke risk factors and there is no relationship between age and knowledge with stroke risk factors.

Introduction

Stroke is defined as rapidly developing signs of focal (or global) impairment of brain function lasting 24 hours (unless interrupted by surgery or death) without an obvious nonvascular cause.[1-4] The definition includes patients presenting with clinical signs and symptoms of subarachnoid hemorrhage, intracerebral hemorrhage, thrombosis and embolism. Hemorrhagic stroke is defined as a stroke event with a diagnosis of subarachnoid hemorrhage or intracerebral hemorrhage and ischemic stroke is defined as an event with a diagnosis of thrombosis or embolism. Transient Ischemic Attack (TIA) and chronic cerebral vascular disease were excluded. On the basis of survival status within 28 days of the event, located stroke events were subdivided into fatal and nonfatal events so Stroke is the rapidly developing clinical signs of focal (or global) impairment of brain function with symptoms lasting 24 hours or more or leading to death, in the absence of other obvious causes other than vascular.[5-7]

Indonesia is the country with the largest number of stroke patients in Asia, it is estimated that every year 500,000 people are affected by stroke, and about 25% or 125,000 people die and the rest experience mild or severe disability. Currently stroke ranks third as a deadly disease after heart disease and cancer, while in Indonesia stroke ranks first as a cause of death in hospitals. If there are no better stroke prevention efforts, the number of stroke patients in 2020 is predicted to increase 2-fold.[8-10]

Based on Riskesda 2013 data, stroke prevalence in Indonesia increased from 8.3 per 1000 population in 2007 to 12.1 per 1000 population in 2013. South Sulawesi has the highest prevalence of stroke compared to other provinces in Indonesia based on the highest diagnosis of health workers and symptoms at 17.9%, an increase of 10.5% from 2007 at 7.4%.[11]

People who are physically inactive (those who exercise less than three times per week, each for 30 minutes) have almost a 50% increased risk of stroke compared to those who are active. Physical inactivity can lead to weight problems and increased blood pressure and is associated with diabetes, all of which are important risk factors for stroke. Inactivity also contributes to the onset of early atherosclerosis and other cardiovascular diseases, such as heart attacks.[10-13]

The results of stroke disease surveillance that we carried out at Dr. Wahidin Sudirohusodo Hospital, which is a referral hospital for stroke patients in eastern Indonesia, showed fluctuations in stroke patients treated. Data obtained from Wahidin Sudirohusodo Hospital

Makassar in 2017 showed that the incidence of stroke ranked 6th of all hospitalized patients, in this case stroke associated with cerebral infarction was 269 people, including 148 men and 121 women, with the highest age classification of 45-65 years (115 people), followed by age ≥65 years (88 people), 35-44 years (61 people), and 25-34 years (5 people). Meanwhile, stroke caused by intracerebral hemorrhage ranked 20th of all patients treated at Wahidin Sudirohusodo General Hospital, which reached 123 people, of which 66 were men and 57 were women, with the highest age classification also occupied by 45-64 years of age (73 people), then successively ≥65 years of age (39 people), 35-44 years (10 people), and 25-34 people (1 person).[14-16]

Materials and Methods

Research design

This study is an Analytical Observational study with a Cross Sectional design, which is a research design where risk and effect factors are taken together at one time.[17]

Study participants

The population in this study were all high school students in Makassar City as many as 29440 students, the sample in this study were some high school students in Makassar City totaling 896 students.

Sample size calculation

Because the population is known, the large formula using Slovin is:

$$n = \frac{N}{1 + Ne^2}$$

Where :

N = Population

n = Sample

e^2 = Margin of Error = 0.05

So :

n = N / (1 + (N x e^2)) = 29440/(1+(29440x0.05^2) = 29440/(1+ 29440x0.0025) = 29440/74.6 = 394.68 = 395

How to draw samples with Random Sampling (random)

The data collected is primary data originating from 10 schools in the city of Makassar. Data collection was done by filling in observation sheets in the form of a checklist through questions and answers to the research sample.

This study began after obtaining permission from the South Sulawesi provincial education office followed by visiting the school that became the research site by collecting students who became research samples and taking blood pressure measurements, measuring height and weight and asking questions and filling out a list of questions according to the research variables, namely age, gender, obesity, hypertension, family history, stress, physical activity risky foods and smoking which was carried out for less than 15 minutes per student.

Data analysis

For general analysis such as percentage and distribution of each research variable, bivariate analysis in the form of Odds Ratio test to determine the risk of independent variables on the dependent variable and for multivariate analysis to determine the effect of one or more of the independent variables on the dependent variable.

Ethical clearance

This research used ethical clearance issued by the Ethics Committee of the Faculty of Medicine, Hasanuddin University. Number: 925/H04.8.4.5.31/PP36-KOMETIK/2020

Result

The results of the study based on bivariate analysis and multivariate analysis can be seen in Tables 1 and 2.

Discussion

Analysis of stroke risk factors is intended to answer research questions, as well as to identify variables that are the main predictors of stroke. In this study, the statistical test used was the Odds Ratio test to see the magnitude of the risk of each variable on the incidence of stroke, then to see the influence of variables on the incidence of stroke was carried out by path analysis.

The results showed that the risk factors for blood pressure at an early age are very high, this is evidenced in several related studies where blood pressure that continues to increase slowly will damage the walls of blood vessels by hardening the arteries and encouraging the

formation of blood clots and aneurysms, which will eventually lead to stroke, especially in people over 45 years old.[18-20] Hypertension is the most important stroke risk factor in America. Nearly 80% of patients diagnosed with first-time stroke have a Blood Pressure (BP) of [140/90. There is an additional risk of stroke at BP above 115/75, in developed countries, such as the United States, which have an older population that tends to have higher BP, the impact of BP on stroke risk is very obvious.[21-23] Diabetes causes changes in the blood vessel system, and plays a role in the atherosclerosis process which will ultimately cause stroke. In people with diabetes, the blood becomes thicker and the load on the blood vessel walls becomes greater so it is feared that it will become thicker and the load on the blood vessel walls becomes greater so it is feared that they will become clogged more easily (especially in small blood vessels such as those in the brain and heart).[24-27] In people who suffer from heart disease (for example abnormalities in the heart valves) due to impaired heart function, embolus/blood clots will arise. The embolus will travel along the circulation to the brain, and become blocked because the diameter of the blood vessels in the brain is very small, resulting in an ischemic (non-haemorrhagic) stroke. In research by Vivian Wing - Yan Lee et al 2016, it was stated that Atrial Fibrillation (AF) heart disease has a risk of 4-5 times the risk of thromboembolic stroke.

The results of the study showed an increase in body weight to obesity, one of the causes of which is a lack of physical activity. This is reinforced by other studies that show there is evidence of a strong relationship between BMI and physical activity, but there is no evidence of a modifying effect by smoking, alcohol intake or BMI. there is no evidence that the relationship varies by vascular type.[28-30]

Smoking behavior in this study shows that this influential risk factor is supported by research Sounghoon Chang explaining the age distribution, men aged 40-49 years were the largest population (25.4%). in terms of smoking period, smoking for 10-19 years represents the largest population at 22.1%; 3.8% had smoked for more than 50 years. The prevalence of diagnosed diseases was 2.6% for stroke, 1.5% for myocardial infarction, 20.7% for hypertension, and 8.7% for diabetes Excess cholesterol in the blood, the medical term is called hyperlipidemia, is an indirect risk factor for stroke. Why is it called that because excessive cholesterol in the blood does not directly cause stroke, but rather increases the risk of atherosclerosis plaque formation in blood vessels. As is known, atherosclerotic plaque is responsible for the process of stroke due to blockage (ischemic stroke). This is supported by Da Lu's research that high serum non-HDL-C, age, education, homocysteine levels, and Hamd score are independent risk factors for cognitive decline in patients with acute ischemic

stroke. The risk of cognitive impairment after acute ischemic stroke increases with increasing levels of non-HDL-C. These parameters are easy to assess in a clinical setting.[31-33]

Risk factors for stroke that cannot be modified are: i) Stroke can affect any man and woman from childhood to adulthood. There is no benchmark on how old a person is prone to stroke, although stroke usually affects someone over 65 years old (stroke in children is very rare and is usually associated with congenital abnormalities). Nowadays, with unhealthy lifestyles in urban areas, stroke can even affect someone who is 30 years old; ii) Stroke can be caused by heredity because risk factors for stroke such as hypertension and diabetes are generally passed down from one generation to the next and in some studies there is indeed a link between heredity and the incidence of stroke.

In a study Xiaoming Ling concluded his findings that genetic variations of the ABO gene may contribute to LAA susceptibility but not to ischemic stroke and SVD in a Chinese population.[31]

Doing physical activity will prevent us from various diseases, by doing adequate physical activity we can reduce the increase in blood sugar levels, cholesterol levels, and avoid obesity and strengthen the heart. Where all of that is a risk factor for stroke. Thus, by doing adequate physical activity we can avoid stroke. In a study with a sample size of 79 subjects experiencing lethargy and 46 mild dizziness. Subjects with severe dizziness were less physically active, reported more fear of falling, falling, depression/anxiety, diabetes, stroke/TIA, heart disease, higher number of medications and antihypertensive drugs, low quality of life and health, and worse appearance physically.

Physical activity is not merely doing sports, by doing gardening activities, walking or cycling to work, to the mosque, to the market or other places will burn calories in the body so as to avoid accumulation in the blood, especially on the walls of blood vessels. There are even wise people who say every footstep will prevent heart disease and stroke. It would be better if you can take the time to do sports 3 - 4 times a week for 30 - 45 minutes, of course it will nourish the body and prevent the body from dangerous diseases.[34-38]

Conclusions

There is a relationship between gender, hypertension, obesity, family history, stress, physical activity, smoking behavior and the risk of stroke in high school children in the city of Makassar, while age has nothing to do with the risk of stroke, and in the multivariate analysis the factor that is most related is family history.

The sample size and students' knowledge about stroke risk factors are limitations of this study.

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Table 1. Analysis of relationships between variables.

Age	High risk		Low risk		Total		(cl 95%)		OR	P
	N	%	N	%	N	%	Lower	Uper		
15-16	30	9.2	297	90.8	327	100			0.708	0.163 Expected 0 cell
17-19	71	12.5	498	87.5	569	100	0.452	1.112		
Total	101	11.3	795	88.7	896	100				
Gender										
Male	51	17.7	237	82.3	288	100			2.402	0.000 expectet 0 cell
Female	50	8.2	588	91.8	608	100	1.580	3.650		
Total	101	11.3	795	88.7	896	100				
BMI										
Fat	51	46.8	58	53.2	109	100			12.961	0.000 expectet 0 cell
Normal - skinny	50	6.4	737	93.6	787	100	8.078	20.797		
Total	101	11.3	795	88.7	896	100				
Hipertension										
Prahipertensi	90	19.8	365	80.2	455	100	5.067	18.305	9.639	0.000 expectet 0 cell
Normal	11	2.5	430	97.5	441	100				

Total	101	11.3	795	88.7	896	100				
Family history of disease										
Present	47	33.8	92	66.2	139	100	4.252	10.403	6.651	0.000 expectet 0 cell
None	54	7.1	703	92.9	757	100				
Total	101	11.3	795	88.7	896	100				
Stress							4.395	11.529	7.118	0.000 expectet 0 cell
Present	77	23.8	247	76.2	324	100				
None	24	4.2	548	95.8	572	100				
Total	101	11.3	795	88.7	896	100				
Physical activity										
Heavy	29	29.0	71	71.0	100	100				0.000 expectet 0 cell
Medium-light	72	9.0	724	91.0	796	100	2.503	6.739	4.107	
Total	101	11.3	795	88.7	896	100				
Risk eating										
High risk	100	12.4	708	87.6	808	100	1.693	89.203	12.288	0.003 Expectet 0 cell
Low risk	1	1.1	87	98.9	88	100				
Total	101	11.3	795	88.7	896	100				
Smoking behavior							4.401	11.947	7.521	
Present	34	39.5	52	60.5	86	100				

None	67	8.3	743	91.7	810	100		0.000 expectet 0 cell
Total	101	11.3	795	88.7	896	100		

Table 2. Multivariate analysis of variables with stroke risk in high schools in Makassar City, South Sulawesi Province.

NO	VARIABLES	SE	Beta	t	Sig
1	Gender	0.015	-0.038	-2.123	0.034
2	BMI	0.018	-0.009	-0.564	0.573
3	Hipertension	0.039	0.000	-0.060	0.952
4	Family history of disease	0.024	0.889	38.021	0.000
5	Stress	0.012	-0.009	-0.573	0.567
6	Physical activity	0.018	0.033	2.134	0.033
7	Risk eating	0.019	-0.003	-0.171	0.864
8	Smoking behavior	0.022	0.015	0.867	0.386