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Research Article

Relationships Between Lifestyle Models with Stroke Occurrence in South Sulawesi, Indonesia

¹Muhammad Awal, ²Ridwan Amiruddin, ³Sukri Palutturi and ⁴Anwar Mallongi

¹Faculty of Public Health, Hasanuddin University, Makassar, Indonesia

²Department of Epidemiology, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia

³Department of Administration Health Policy, Faculty of Public Health, Hasanuddin University Makassar, Indonesia

⁴Department of Environmental Health, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia

Abstract

Background and Objective: Stroke is a disease condition caused by the interruption of the blood flow supplying the brain; it is a sudden blockage or rupture of blood veins. This condition causes brain tissue to not be exposed to the blood flow of oxygen and nutrients, with the brain becoming damaged. The aim of this research was to determine the model of risk factors for stroke in South Sulawesi.

Materials and Methods: This study use observational analytic research with a case control design, which is a study design that epidemiologists use to study relationship concerning the level of exposure to a variety of disease states or other health problems. A case is a stroke patient and the control is someone who is not a stroke patient. This analysis uses odds ratio logistic regression and the value of $\alpha = 0.05$. **Results:** The results of this research show the significant association between stroke with hypertension, Odd Ratio (OR) = 4.06, with 95% CI 3.25-5.0; the association of physical activity with the occurrence of stroke, OR = 1.69, with 95% CI 1.29-2.23 and the association of obesity and stroke, OR = 2.00 with 95% CI 1.64-2.47. There is a relationship between smoking and the incidence of stroke, OR = 1.81 with 95% CI 1.42-2.32; however, for stress, $p = 0.619$ ($p > 0.05$), which means that stress has no relationship with the incidence of stroke, OR = 1.10 with 95% CI 0.75-1.63. **Conclusion:** To conclude that stroke might be leaded due to the less physical activity, smoking and stressful lifestyle behaviors that end with hypertension. Hypertension is the risk factor that most influences the incidence of stroke compared to other risk factors but all of these risk factors can be eliminated with lifestyle modification.

Key words: Stroke patient, hypertension, lifestyle models, brain tissue, blood flow

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Corresponding Author: Anwar Mallongi, Department of Environmental Health, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Worldwide, fifteen million people are affected by stroke every year, with more than 5 million people dying as a direct result of strokes and 5 million being permanently disabled¹. In the USA, the UK and developing countries, stroke is the number three killer after heart disease and cancer¹⁻³.

In addition to being the second leading cause of death, stroke is also the number one cause of disability world widely. This disease has been a global health problem and has become increasingly important, with two-thirds of strokes now occurring in countries that are developing. Globally, at present, there are approximately 80 million people who have suffered a stroke². There are approximately 13 million new stroke victims each year, of which approximately 4.4 million die within 12 months². There are approximately 250 million family members related to a person who is a stroke survivor⁴. During the course of their lives, approximately four out of five families will have one member who is affected stroke^{2,4}.

The number of stroke patients in Indonesia is now at the highest level, making the country the largest state with stroke in Asia. The prevalence of stroke in Indonesia has reached 8.3/1000 population⁵. This prevalence figure increases with increasing age. Indonesian national data show that stroke is the leading cause of death, with the incidence of stroke/year in Indonesia being 15.4%, gaining approximately 750,000 and with 200,000 of these cases being recurrent strokes⁵ (South Sulawesi, according to 2013 basic health research data, shows the highest incidence of stroke in Indonesia). Thus, the purpose of this study is to examine the lifestyle factors that affect the incidence of stroke in South Sulawesi.

MATERIALS AND METHODS

Locus and research time: This research was conducted in South Sulawesi at the Dr. Wahidin Sudirohusodo General Hospital and the Hasanuddin University Teaching Hospital as the research site; it was performed over 6 months from June-December, 2016.

Research design: This research is an analytic observational study with a case control design, which is a study design that epidemiologists use to study relationships concerning the level of exposure to a variety of disease states or other health problems⁶.

Population: The population in this research was consisted entirely of 1860 stroke patients who were registered in the

medical record in the hospital in 2016. Stroke patients recorded in the medical record from General Hospital Dr. Wahidin Sudirohusodo in Makassar and Hasanuddin University Teaching Hospital who have completed data in accordance with the research variables. However, the controls were non-stroke patients registered in the medical records of the Hasanuddin University Education Hospital who had complete data in accordance with the research variables.

Data collection methods: The data were derived from medical records at the Dr. Wahidin Sudirohusodo General Hospital in Makassar and the Hasanuddin University Teaching Hospital in 2016, with the charging data retrieval observation sheet in the form of a checklist, through observations of patient records by viewing the variables.

Data analysis: A general analysis of the percentage and distribution of each study variable was conducted. The bivariate analysis is the Odds Ratio test to determine the risk of the independent variables on the dependent variable and for multivariate analysis with logistic regression to determine the effect of one or more of the independent variables on the dependent variable. The SPSS version 21 on 7th edition⁷, software package was used with $\alpha = 0.05$.

RESULTS AND DISCUSSION

Table 1 shows that the occurrence of stroke is more common in males, with 53.5%; for women, it was 46.5%. In the age group of 50-59, it was 32.1%, for those with a primary school education, it was 32.0%, for housewives, it was 31.2% and for those who were married, it was 94.7%. Based on the chi-square test, then determine the gender, age group, education and marital status of the respondents is homogeneous ($p < 0.05$).

Figure 1 shows that more respondents are suffering from hypertension (61.7%), followed by less physical activity (83.0%), obesity (53.1%), no stress (92.7%) and no smoking (77.4%) respectively. However, the smallest determinant factors to stroke were stress (7.3), no physical activity with (17), hypertension (38.3), obesity (7.3) and smoking (22.6), respectively.

The risk lifestyle factors on the occurrence of stroke in South Sulawesi are illustrated in the following Table 2.

The statistical results obtained with the chi-square test are $p = 0.000$ ($p < 0.05$), which means that there is a relationship between smoking and the occurrence of stroke, OR = 1.81, with 95% CI 1.42-2.32, which means that smoking

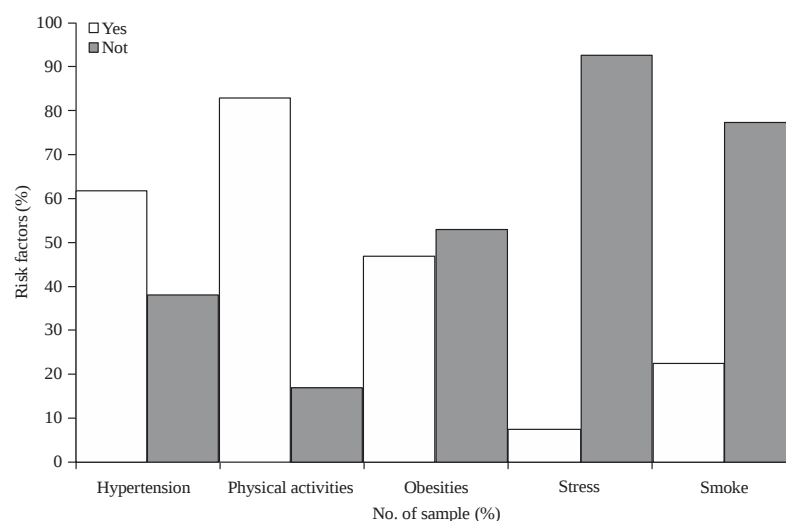


Fig. 1: Determinant factors that affect the stroke level in Makassar

Table 1: Characteristics of the respondents based on the occurrence of stroke in South Sulawesi

Characteristics of respondents	Stroke				Total		p-values
	Case		Control				
	No.	%	No.	%	No.	%	
Sex							
Male	401	53.5	372	49.6	773	51.5	0.134
Female	349	46.5	378	50.3	727	48.5	
Age group							
10-19	1	0.1	1	0.1	2	0.1	0.606
20-29	16	2.1	27	3.6	43	2.9	
30-39	25	3.3	36	4.8	61	4.1	
40-49	94	12.5	91	12.1	185	12.3	
50-59	241	32.1	238	31.7	479	31.9	
60-69	224	29.9	212	28.3	436	29.1	
70-79	115	15.3	115	15.3	230	15.3	
≥80	34	4.5	30	4.0	64	4.3	
Education							
No School	90	12.0	69	9.2	159	10.6	0.230
SD (primary school)	240	32.0	254	33.9	494	32.9	
Junior high school	84	11.2	80	10.7	164	10.9	
Senior high school	232	30.9	251	33.5	483	32.2	
Diploma	18	2.4	25	3.3	43	2.9	
S1 (strata one)	78	10.4	68	9.1	146	9.7	
S2 (strata two)	8	1.1	3	0.4	11	0.7	
Job							
Housewife	234	31.2	233	31.1	467	31.1	0.000
Official servant	128	17.1	167	22.3	295	19.7	
Private	99	13.2	123	16.4	222	14.8	
Entrepreneur	54	7.2	12	1.6	66	4.4	
Farmer	68	9.1	46	6.1	114	7.6	
Jobless	62	8.3	25	3.3	87	5.8	
Pensioner	95	12.7	131	17.5	226	15.1	
Student	10	1.3	13	1.7	23	1.5	
Marital status							
Married	710	94.7	706	94.1	1416	94.4	0.723
Single	37	4.9	42	5.6	79	5.3	
Widow	2	0.3	2	0.3	4	0.3	
Widower	1	0.1			1	0.1	

Table 2: Distribution of the risk of lifestyle factors on the occurrence of stroke in South Sulawesi

Life style	Stroke						P*	OR**
	Case		Control		Total			
	No.	%	No.	%	No.	%		
Hypertension								
Yes	581	77.5	344	45.9	925	61.7	0.000	4.06
Not	169	22.5	406	54.1	575	38.3		3.25-5.07
Physical activities								
Minus	650	86.7	595	79.3	1245	83.0	0.000	1.69
Normal	100	13.3	155	20.7	255	17.0		1.29-2.23
Obesity								
Yes	416	55.5	287	38.3	703	46.9	0.000	2.00
Not	334	44.5	463	61.7	797	53.1		1.64-2.47
Stress								
Yes	57	7.6	52	6.9	109	7.3		1.10
Not	693	92.4	698	93.1	1391	92.7	0.619	0.75-1.63
Smoke								
Yes	208	27.7	131	17.5	339	22.6	0.000	1.81
Not	542	72.3	619	82.5	1161	77.4		1.42-2.32

*P: Probability, **OR: Odd ration

Table 3: Lifestyle factors that present the greatest risk of stroke in South Sulawesi

Variables	B [#]	Wald ^{##}	P	Exp (B)	95% CI*	EXP(B)**
Hypertensions	1.276	117.955	0.000	3.581	2.845	4.508
Smoking	0.556	17.168	0.000	1.744	1.341	2.269
Physical Activities	0.454	8.995	0.003	1.575	1.171	2.120
Stress	0.340	2.478	0.115	1.406	0.920	2.148
Obesities	0.484	18.465	0.000	1.623	1.301	2.024
Constant	-4.668	63.030	0.000	0.009		

*CI: Confidential Interval #B: Beta value, ** Exponential Beta, ##Wald: Degree of significance

is a risk factor of stroke. The OR value of 1.81 means that the respondents who smoke will have a 1.81 times higher risk of stroke compared to the respondents who do not smoke.

Table 3 shows that the logistic regression results determined that the factor that presents the greatest risk of stroke is hypertension, with OR = 3.58.

An atherosclerotic vascular disease is the leading cause of death worldwide. There are approximately 13 million deaths annually caused by diseases of the blood veins. Worldwide, Coronary Artery Disease (CAD) and stroke account for 12.2% and 9.7% of total deaths per year, respectively. *Infark miokard* is a main cause of long-term mortality in stroke patients who are still alive, though stroke is the leading cause of disability in the world⁸.

Hypertension is a target for long-term stroke prevention, but hypertension management procedures should be considered properly; hypertension can be controlled and its management can be planned and structured to prevent a first stroke or stroke recurrence^{9,10}. A decrease in HDL cholesterol is correlated with the occurrence of Acute Ischemic Stroke (AIS) with DM and particularly in the 70 population group, this reduction assists in preventing the incidence of stroke¹¹.

Physical Activity (PA) has potential benefits after stroke or Spinal Cord Injury (SCI), especially in improving the efficiency and functional capacity in the activities of daily living. Presently, many people who could benefit from the PA can be routinely associated with functional capacity and concern for danger^{12,13}.

The prevalence of obesity [defined as in terms of Body Mass Index (BMI)] among adults in the USA has increased from 13-34% over the last half century. Similar trends have been observed in other countries, although the absolute prevalence of obesity varies. For example, compared to the USA, the obesity rate is now lower in Canada (24%), Germany (23%) and China (4%)^{14,15}.

The obesity is a result of excess energy intake compared to the energy needed by the body, causing the excess energy intake to be stored as fat. Physical activities are one factor that can increase energy needs; thus, when physical activity is low, the likelihood of obesity will increase, whereas medium and high physical activity will reduce the likelihood of obesity¹⁶.

In the condition of refraction, obesity causes oxidative stress due to the imbalance proxy and anti-oxidants in the body. Obesity occurs due to excessive *lipogenesis* and

the inhibition of *lipolysis lipogenesis* is stimulated by a high-carbohydrate diet, which leads to the process of fat deposition and includes the process of synthesis of fatty acids; then, *triglyceride* synthesis occurs in the heart and energy derived from fat that exceeds the body needs are stored in fatty tissue and the energy derived from carbohydrates and protein that came from food can be stored in the fatty tissue¹⁷.

Physical activities are also an important determinant in increased weight because the condition of inactivity can lead to the incidence of overweight. The data show that obesity is more likely in people with light activity, for example, those who spend their spare time just reading and watching television and people who choose to use a motor vehicle instead of walking in doing activities¹⁸.

High blood pressure is the only risk factor that can be treated. High blood pressure treatment can decrease the incidence of stroke by half. However, the occurrence of stroke is starting to look less even undiscovered high blood pressure medication that effectively¹⁵⁻¹⁸. Hypertension is a main public health problem. The occurrence and prevalence of hypertension have increased at an alarming rate. Hypertension is a main cause of vascular disease. According to the WHO report published in 2012, the prevalence of hypertension in men and women over the age of 25 years was 23.1 and 22.6%, respectively. The number of people who suffer from hypertension is projected to reach 60% in 2025¹⁹⁻²².

Some researches suggest that a lifestyle that is not healthy will have a greater risk of developing hypertension, risk factors such as smoking, lack of activity and stress which will eventually lead to stroke. Hypertension is a disease that cannot be separated from the way of life is not healthy to be a precipitating factor the emergence of hypertension, so this needs to be detected early is with regular blood pressure checks and most importantly eliminates the primary disease that became a trigger hypertension^{19,23}.

Some researches show that someone who is overweight has more than 20% and hypercholesterolemia have a greater risk of developing hypertension²⁴. The risk factors are mainly due to a lifestyle that is not healthy. Socio-cultural factors in Indonesian society are different from those in developed countries, so that factors related to the occurrence of hypertension in Indonesia have different possibilities. Performing regular activities (aerobic physical activity for 30-45 min day⁻¹) is known to be effective in reducing the relative risk of hypertension by 19-30%. Thus, is the case with low respiration cardio fitness in middle age are thought to increase the risk of hypertension by 50%^{19,25,26}.

The implication of this research is to prevent the occurrence of stroke so everyone should keep the pattern of his life, especially physical activity, smoking and stress. The application of this research is the existence of a planned program both individually and government programs to ensure that the lifestyle of the community can be maintained properly.

Limitations of this study:

- The secondary data were used; thus, the information obtained was limited
- Not all lifestyle factors could be included as research variables

CONCLUSION

Less physical activity, smoking and stressful lifestyle behaviors can lead to hypertension, leading to a stroke. Hypertension is the risk factor that most influences the incidence of stroke compared to other risk factors, but all of these risk factors can be scaled with lifestyle modification.

SIGNIFICANCE STATEMENT

This study discovers that less physical activity is the most important lifestyle in the incidence of stroke. Then, combination with smoking can lead to the occurrence of arteriosclerosis, which aggravates the occurrence of hypertension. This study will help the researcher to uncover the critical point of stroke occurrence conclude that stroke still attacks middle-aged individuals but has begun to shift to younger individuals along with lifestyle changes.

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