

The Relationship Cholesterol Level, Diet and Physical Activities with Recurrent Incidence Stroke in Hospital of Aceh, Indonesia: A Cross Sectional Study

Maulida Sari^{1*}, Cut Husna², Marlina²

¹Master Program of Nursing Science, Syiah Kuala University, Banda Aceh, Indonesia, 23111,
²Faculty of Nursing, Universitas Syiah Kuala, Banda Aceh, Indonesia, 23111

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ABSTRACT

Recurrent strokes could increase morbidity and mortality rates and cause neurological deficits with severe complications, so it is necessary to prevent the risk factors for recurrent strokes. The purpose of the study to determine the relationship between cholesterol level, diet, and physical activities in post-stroke patients in Hospital of Aceh, Indonesia. The correlation study with a cross-sectional study design was used in this study. The population was post-stroke patients who are treated at the Polyclinic of the Aceh Hospital, Indonesia. The sampling method used *purposive sampling* with a total sample of 154 respondents. The instruments in this study used a *Physical Activity Level* (PAL) questionnaire consisted of 15 items, and patients' clinical condition questionnaire. Data collection techniques by means of health checks of clinical conditions and guided interviews. Data analysis used Chi-square test and logistic regression. The results of the study showed relationship between cholesterol level, diet, and physical activities with the incidence of recurrent stroke in post-stroke patients ($p < 0.05$). The most dominating factor was diet (OR: 2.574; 95%CI: 0.936 -7.075). The results of the study need for the nurses to provide health education to patients regarding the risk of recurrent strokes, by controlling cholesterol levels and regulate healthy lifestyles and diets.

Keywords: Recurrent stroke, cholesterol, diet, physical activities

INTRODUCTION

Stroke is the number two cause of death and the number three cause of disability. Currently, based on 2021 data, there are more than 12.2 million new strokes every year. Globally, one in four people over the age of 25 will experience stroke. There are 6.5 million people dying from stroke each year and more than 143 million people losing their health each year due to stroke-related deaths and disabilities. The burden from stroke increased substantially, namely an increase of 70.0%

in stroke incidence, 43.0% of stroke deaths, 102.0% of prevalent strokes and 143.0% of *Disability-Adjusted Life-Years Lost* (DALYs) and most of the stroke burdens were in low- and lower-middle-income countries. Death cases due to stroke in Indonesia reached 252,473 cases or 14.83% of the total number of deaths due to disease. Indonesia is ranked seventh in the world for deaths from stroke ¹.

The risk factors of recurrent stroke into *modifiable* risk factors and *non-modifiable* risk factors. The risk factors that can be modified

Corresponding author: **Cut Husna**, Department of Medical and Surgical Nursing, Universitas Syiah Kuala, Banda Aceh, Indonesia, 23111

E-mail: cuthusna@unsyiah.ac.id

are hypertension, smoking, diabetes mellitus, diet, lack of physical activity, obesity, high blood cholesterol, carotid artery disease, artery peripheral disease, atrial fibrillation (AFib) and other heart diseases. Meanwhile, risk factors that cannot be modified include age, gender, race, hereditary and history of stroke ².

MATERIALS AND METHODS

Design

The quantitative study with a cross-sectional design was used in this study to identify the relationship between cholesterol level, diet and physical activities in Pasien post-stroke at Hospital of Aceh, Indonesia.

Participants

This study was conducted at the Hospital of Aceh, Indonesia. A total of 154 stroke patients who were outpatient at the Neurological Disease Polyclinic participated in this study. The inclusion criteria of respondents are as follows: (1) Patients who had Ischemic stroke more than once, (2) >25 years old, (3) Compos mentis (fully) awareness, (4) No have aphasia, Wernicke and broca, (5) willing to be involved in this study by signing written informed consent.

Data Collections

Data collection was carried out from 03-12 August 2022. The instruments used were

questionnaires of respondents' characteristics, namely Cholesterol value, diet (food commonly consumed) and *Physical Activity Level* (PAL) with categories PAL 1.4-1.69 (light physical activity) PAL 1.7-1.99 (moderate physical activity) and PAL \leq 2.0-2.40 (heavy physical activity) ³.

This instrument has also been tested for Content Validity by 2 (two) expert experts, namely Doctor of Neuroscience Specialist and Doctor of Nursing.

Data Analysis

The data analysis using univariate, bivariate and multivariate analysis. Univariate analysis in this study was carried out to obtain the results of the frequency distribution of each independent variable, namely cholesterol level, diet and physical activities, as well as to identify the frequency distribution of dependent variables, namely the incidence of recurrent strokes. Bivariate analysis using the Chi-square test to examine the relationship of independent variables and dependent variables. Then, multivariate test used a logistic regression to examine the cholesterol level, diet and physical activities that were dominant factors with recurrence stroke events.

RESULT

The results of the study are shown in table 1:

Table 1: Characteristics of the Respondents (n=154)

No	Characteristics of Respondents	Frequency	Percentage
1	Age (year)		
	Early adulthood (18-40)	10	6.5
	Intermediate adult (41-60)	90	58.4
	Late adult (>61)	54	35.1
2	Gender		
	Male	65	42.2
	Female	89	57.8
3	Work		
	Not Working	39	25.3
	Retired	4	2.6
	Farmer	26	16.9
	Employed	16	10.4
	Self employed	69	44.8

No	Characteristics of Respondents	Frequency	Percentage
4	Education		
	Low	105	68.2
	Intermediate	13	8.4
	High	36	23.4
5	Marital status		
	No married	2	1.3
	Married	128	83.1
	Divorce	24	15.6
6	Cholesterol		
	Normal	39	25.3
	Abnormal	115	74.7
7	Long suffering from cholesterol		
	≤2 Years	6	15.4
	>2 Years	33	84.6
8	Diet		
	No fat	60	39.0
	Fatty	94	61.0

Table 1 shows that of the 154 respondents, it was found that as many as 90 (58.4%) respondents were young adults, as many as 89 (57.8%) respondents were female, as many as 69 (44.8%) respondents worked as self-employed, as many as 105 (68.2%) respondents were educated, as many as 128 (83.1%) respondents were married.

Based on the risk factor, it was found that as many as 115 (74.7%) suffered from cholesterol, long suffering from cholesterol ≤2 years as many as 121 (78.6%), as many as 94 (61%) respondents had a fatty diet.

Table 2 shows that as many as 122 (79.2%) of respondent had strenuous physical activity and as many as 9 (5.8%) respondents had light physical activity.

Table 3 found that as many as 125 (81.2%) respondents had repeated strokes ≤2 times, and as many as 29 (18.8%) respondents had repeated

Table 4 shows that of the 115 post-stroke patients with abnormal cholesterol, 86 (74.8%) patients had repeated strokes 2 times and of the 39 post-stroke patients with normal cholesterol, all 39 (100%) had repeated strokes 2 times. The results of the analysis found a value of $p = 0.001$ which means that there is

Table 2. Physical Activities of the Respondents (n = 154)

No	Physical activities	Frequency	Percentage
1	Light	9	5.8
2	Keep	23	14.9
3	Heavy	122	79.2

Table 3. Recurrent Stroke Events in Post-Stroke Patients (n = 154)

No	Recurrent strokes	Frequency	Percentage
1	≤2 times	125	81.2
2	>2 times	29	18.8

a relationship between cholesterol and the incidence of recurrent strokes and of the 60 post-stroke patients who consumed non-fatty foods as many as 54 (90%) patients had repeated strokes 2 times and of the 94 Post-stroke patients who consumed fatty foods as many as 71 (75.5%) patients had repeated strokes 2 times. The results of the analysis test showed that $p = 0.043$ was found, which means that there is a relationship between diet and the incidence of recurrent strokes and then the table shows that of the 9 post-stroke patients who had light physical activity, all 9 (100%) had repeated strokes 2 times and of the 23 patients who had moderate physical

Table 4. Cholesterol, Diet and Physical Activity in Post-stroke Patients (n = 154)

No	Variable	Recurrent strokes						a	p-value
		≤2 times		>2 times		Total			
		f	%	f	%	f	%		
1	Cholesterol level						0.05	0.001	
	Normal	86	74.8	29	25.2	115			100
	Abnormal	39	100	0	0	39			100
2	Diet						0.05	0,043	
	No Fatty	54	90,0	6	10,0	60			100
	Fatty	71	75.5	23	24.5	94			100
3	Physical activity						0.05	0.009	
	Light	9	100	0	0	9			100
	Keep	23	100	0	0	23			100
	Heavy	93	76.2	29	23.8	122			100

activity, a total of 23 (100%) patients had repeated strokes 2 times, followed by 122 post-stroke patients who had strenuous physical activity, as many as 93 (76.2%) patients had repeated strokes 2 times as well. The results of the analysis test showed a value of $p = 0.009$ which means that it shows that there is a relationship between physical activity and the incidence of recurrent strokes.

Based on a multivariate analysis with logistic regression tests, it was found that diet was the most dominant predictor associated with the incidence of recurrent strokes with an odds ratio (OR: 2.574).

DISCUSSION

Relationship of Cholesterol Levels With Recurrent Stroke Events in Post-Stroke Patients

Based on the results of the study, it was found that as many as 115 (74.7%) stroke patients with post-stroke had cholesterol while as many as 39 (25.3%) respondents did not experience cholesterol. The results of the study found that out of 115 respondents, as many as 86 (74.8%) had cholesterol and had repeated strokes ≤2 times, as many as 29 (25.2%) respondents had strokes >2 times of the 39 respondents, it was found that all 39

(100%) of respondents experienced repeated strokes ≤2 times. The results of the analysis found $p = 0.001$ which showed that there was a relationship between cholesterol and the incidence of recurrent strokes.

The results of this study are in line with the research conducted found that primary and secondary prevention in patients with ischemic stroke and hemorrhagic cerebral can be done by changing lifestyle and diet, treatment of diseases such as Hypertension, Diabetes Mellitus and problems of fat or cholesterol in the blood that cannot be controlled⁴. The previous study found that patients who were concerned with Cholesterol and heart disease had a greater risk of recurrent strokes compared to patients who had no cholesterol and heart disease⁵ myocardial infarction, and cardiovascular death. For more than a decade, the main pharmacological option to prevent stroke and myocardial infarction through LDL-cholesterol lowering was the use of statins. During the recent years, two novel classes of drugs have proven their efficacy and safety to reduce LDL-cholesterol and prevent cardiovascular events in large, well-conducted randomized controlled trials: ezetimibe and proprotein convertase subtilisin/kexin type 9 (PCSK9).

A further⁶ studies found that there was a significant association of dyslipidemia with

recurrent ischemic stroke in outpatients and inpatients. Different researchers found by 730.6% female found that there was no significant association between cholesterol and the incidence of recurrent strokes in post-stroke patients.

⁸ States that there are three factors related to coping mechanism and the formation of healthy and unhealthy behaviors in patients, one of which is the presence of focal stimulation, where this stimulus has a direct impact on patients who experience disease, cholesterol is a condition of natural blood fat that is needed in the body, but excess fat in the blood can cause its own diseases for sufferers, one of which is stroke, high levels of fats in the blood or hyperlipidemia cause blockages in blood vessels and cause rupture of blood vessels, especially in the brain so that patients can have a stroke, but related to the incidence of diabetes mellitus, further examination is needed to determine how far diabetes has a risk of recurrent stroke in patients.

The Relationship of Diet with Recurrent Stroke Events in Post-Stroke Patients

Eating a balanced and nutritious diet can reduce the risk of heart disease and stroke ⁹.

Based on the results of the study, it was found that out of 154 respondents, as many as 94 (61.0%) respondents consumed fatty foods and as many as 60 (39.0%) respondents consumed non-fatty foods. The results of the study found that, out of 94 respondents, as many as 71 (75.5%) respondents experienced repeated ≤ 2 times and as many as 23 (24.5%) repeated respondents as many as > 2 times of the 60 respondents, it was found that as many as 54 (90%) respondents who consumed fatty foods had a recurrent stroke ≤ 2 times and as many as 6 (10%) respondents repeated > 2 times. The results of the statistical *continuity correction* test were found $p = 0.043$ which means that it shows that there is a relationship between diet and the incidence of recurrent strokes.

The results of this study are in line with the research conducted ¹⁰ found that using

intervention methods in his research the provision of a diet of avocado fat (vegetable fat) in ischemic stroke patients. Avocados contain serum lipids that can prevent the occurrence of recurrent ischemic strokes in post-stroke patients compared to other fat content that is harmful to post-stroke patients. Patients who are 45 years old have one history of risk factors.

The previous study showed that *low-fat diets* in general can lower diseases related to cardiovascular problems such as stroke. Patients who did not consume fat and consumed fruit had a risk of injury of 0.58 times when compared to patients who did not consume fruit ¹¹.

People with hemorrhagic stroke who are 65 years old or consume sugary, salty, fatty foods and drinks and foods that contain high cholesterol more often than people with ischemic stroke ¹². Furthermore, study ¹³ found that the incidence of stroke with new cases in 1000 people per year of which 6.7 were new cases of stroke (ischemic 5.5 and hemorrhagic 1.2) and cases of recurrent stroke 22.7 (ischemic 18.8 and Hemorrhagic 3.8).

Diets are categorized in contextual stimuli because diets can affect focal stimulus but can still be clearly measured how diet can cause some diseases that are in focal stimulation, diet is a factor that dominates the occurrence of recurrent strokes related to the content of the diet consumed by stroke sufferers, a good diet can prevent the occurrence of recurrent strokes in patients with a risk of stroke, so the diet is very important to be taken care of by patients and families so that recurrent strokes do not occur ⁸.

Relationship of Physical Activities with Recurrent Stroke Events in Post-stroke Patients

The terms physical activity and exercise are often mentioned interchangeably. The two terms have different definitions. Physical activity refers to any body movement that burns calories, whether it's for work or play, daily tasks, or daily commutes. Exercise is one

of the subcategories of physical activity, which refers to planned, structured, and repetitive activities aimed at improving physical fitness and health 14.

Based on the results of the study, it was found that out of 154 respondents, as many as 122 (79.2%) respondents had strenuous physical activity, as many as 23 (14.9%) respondents had moderate physical activity and as many as 9 (5.8%) respondents had light physical activity. Furthermore, table 4.9 found that out of 154 respondents, as many as 122 respondents who did strenuous physical activity experienced repeated strokes ≤ 2 times as many as 93 (76.2%) and those who had strokes >2 times as many as 29 (23.8%), the results of the chi-square statistical test found $p= 0.009$ which means that there is a relationship between physical activity and the incidence of recurrent strokes.

The risk factors for recurrent stroke in post-stroke patients were diet, physical activity and smoking habits ³. The previous study found relationship between *physical activity* where respondents with high activity were 26.2%, as much as 18.9% moderate activity and 54.9% low activity in post-stroke patients ¹⁵. Many factors because recurrent strokes in post-stroke patients such as physical activity in post-stroke ¹⁶to encourage physical activity after stroke, it is important to know what motivates the patients. We aimed to explore possible motivators and barriers for physical activity in patients discharged after minor stroke or transient ischemic attack (TIA).

The results of the correlation analysis test also found that there was a significant relationship between physical activity and repeated strokes. Generally, the so-called physical activity is synonymous with strenuous activities such as sports, walking, jogging, swimming, aerobic gymnastics and riding a bicycle that aims to live a healthier and higher quality life.

The results of a different study mentioned that there was no association of physical activity to the incidence of recurrent strokes in post-stroke patients. Lack of physical activity,

namely lack of exercise and sitting too long, is the fourth leading cause of death in the world.¹⁷

The residual stimulus is an additional stimulus and sometimes it is not realized by the sufferer that it can increase the incidence of stroke or the occurrence of recurrent strokes in patients, patient physical activity is an activity that is commonly done by them every day but excessive or strenuous activities can aggravate the patient's condition and even repeated strokes can occur, patients with a history of recurrent strokes generally mention that the more mobile the healthier it is but this can be a threat to patients with chronic diseases.⁸.

RESEARCH LIMITATIONS

The study was limited to patients with recurrent strokes.

CONCLUSION

The study found a significant association between cholesterol level, diet and physical activities with the incidence of recurrent stroke in post-stroke patients. The diet of the patients is the dominant factors related to the recurrence incident strokes.

Source of funding

None

Conflict of interest

There is no conflict of interest declared by all authors.

Ethical Considerations

The ethical test for this study has been approved by the Research Ethics Committee of the Faculty of Nursing, Universitas Syiah Kuala Banda Aceh, Indonesia with the number 112018140722.

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