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RESEARCH ARTICLE

Exploring the Association between Diabetes Mellitus, Obesity, and Recurrent Stroke Events: a Cross-sectional Study

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Abstract

Stroke is the most significant cause of death and cause of disability in the world because it causes neurological deficits in sufferers, such as muscle paralysis, swallowing weakness, communication damage, and vision disorders to cause death. Stroke can be recurrent and have a severe impact compared to the initial attack. The purpose of this study was to explore the association between diabetes mellitus, obesity, and the incidence of recurrent strokes in post-stroke patients at a regional general hospital in Aceh province. It is a cross-sectional study carried out from 3–12 August 2022. The sampling technique used in this study was a purposive sampling of 154 patients. The instruments used were questionnaires of patient demographic characteristics, data analysis using chi-square assays, and logistic regression. The results showed that there was no association between diabetes mellitus ($p>0.05$) and obesity ($p>0.05$) with the incidence of recurrent strokes. One of the preventive measures for the occurrence of recurrent strokes is to provide education about the prevention of recurrent strokes related to diabetes mellitus and obesity, one of which is a healthy lifestyle. In conclusion, there is no relationship between diabetes mellitus, obesity, and the incidence of recurrent strokes in post-stroke patients at a regional general hospital in Aceh province.

Keywords: Diabetes mellitus, obesity, recurrent strokes

Introduction

Stroke is a condition of nervous disorder characterized by blockage or rupture of blood vessels, which causes a reduction or disruption in the blood supply to the brain, causing brain cells to die due to insufficient or inadequate oxygen and nutrition.[1–3] Stroke is the second major cause of death and disability worldwide.[4–6] In 2019, there were 12.2 million incident cases of stroke, 101 million prevalent cases of stroke, 143 million disability-adjusted life-years (DALYs) lost due to stroke, and 6.55 million deaths from stroke. The incidence of strokes increased by 70.0%, prevalent strokes increased by 85.0%, deaths from stroke increased by 43.0%, and DALYs due to stroke increased by 32.0%. The burden of stroke in people younger than 65 has increased worldwide, the incidence has increased by 25% among adults aged 20–64; and stroke burden towards younger age groups, particularly in low- and middle-income countries.[5,7–9] The number of deaths due to stroke reached 252,473 cases or 14.83% of the total deaths due to disease in Indonesia. Indonesia is ranked seventh in the world for death rate due to stroke.[10]

The incidence of recurrent strokes is a critical clinical endpoint, leading to death, re-hospitalization, and long-term disability. Neurological disorders caused by recurrence are more serious, more difficult to treat, and have a higher mortality rate. Therefore, the study emphasizes the essential need for secondary prevention after the first stroke to reduce recurrence. This is a key takeaway from the study that healthcare practitioners and researchers should consider in their practice and future research.[11,12]

One prevention that can be done is to minimize the risk factors for recurrent strokes from modifiable risk factors, especially obesity.[13–17] This is supported by several studies that state that physical activity, age, gender, hypertension, diabetes mellitus, obesity, and cholesterol

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are factors associated with the occurrence of recurrent strokes.[16,17]

Data on stroke patients who recovered at a regional general hospital in Aceh province is still high; stroke patients also often experience repeated hospitalizations. Based on the description, this study aims to understand the link between diabetes mellitus and obesity and the incidence of recurrent strokes. The objective of this study was to explore the association between diabetes mellitus, obesity, and the incidence of recurrent strokes in post-stroke patients at a regional general hospital in Aceh province.

Methods

Quantitative research with a cross-sectional study was conducted at a regional general hospital in Aceh province in Indonesia. A total of 154 post-stroke patients who went to the Neuroscience Polyclinic participated in this study. Sampling criteria include patients who had an ischemic stroke more than once, were ≤25 years old, compos mentis consciousness, did not have aphasia, Wernicke and Broca, and were willing to be involved in this study with sign informed consent.

The data collection was carried out from 3–12 August 2022. The instrument used is a socio-demographic questionnaire. Technique data collection using health checks and guided interviews. Data analysis using a chi-square test. To overcome the trust of researchers to set inclusion criteria, a detailed description of the research arrangements should be created using questionnaires that have been tested for content validity by experts. This instrument has also undergone a content validity test by 2 (two) expert personnel, namely a neurology specialist doctor and a nursing doctor. Ethical clearance was obtained from the Research Ethics Committee, Faculty of Nursing, Universitas Syiah Kuala, Banda Aceh with ethics number 112018140722.

The univariate and bivariate analyses were used to analyze the collected data. In this study, univariate analysis was carried out to obtain the frequency distribution of each independent variable (diabetes mellitus and obesity) and the frequency distribution of the dependent variable (recurrent stroke incidence). Bivariate analysis uses the chi-square test to see the association between independent and dependent variables.

Results

The socio-demographic characteristics of stroke patients in this study can be seen in Table 1. Most stroke patients at a general regional hospital in Aceh province were aged between 41–60 years (58.1%), and a higher proportion of females (57.8%) than males. Sixty-nine (44.8%) stroke patients were self-employed, 105 (68.2%) had primary school education, and 128 (83.1%) were married. Risk factors for recurrent stroke in subjects were 88 (57.1%) did not have diabetes mellitus and 102 (66.2%) were not obese.

Meanwhile, Table 2 shows that as many as 154 post-stroke patients who were treated at a regional general hospital in Aceh province experienced recurrent strokes, with 125 (81.2%) patients experiencing recurrent strokes ≤2 times.

Table 1 Socio-demographic Characteristics of Stroke Patients

Characteristics	n=154	%
Age (years)		
18–40	10	6.5
41–60	90	58.4
>61	54	35.1
Gender		
Man	65	42.2
Woman	89	57.8
Employment		
Unemployment	39	25.3
Retiree	4	2.6
Farmer	26	16.9
Civil servants	16	10.4
Self-employed	69	44.8
Education		
Primary school	105	68.2
Junior high school	13	8.4
Senior high school	36	23.4
Marital status		
Unmarried	2	1.3
Married	128	83.1
Divorced	24	15.6
Diabetes mellitus		
Not	88	57.1
Yes	66	42.9
Obesity		
Not	102	66.2
Yes	52	33.8

Table 2 Incidence of Recurrent Strokes

Recurrent Strokes	n=154	%
Age (years)	10	6.5
Obesity	102	66.2

Table 3 shows the association between diabetes mellitus, obesity, and the incidence of recurrent strokes in post-stroke patients at a general regional hospital in Aceh province. The results showed that most post-stroke patients who experienced recurrent stroke ≤2 times and >2 times did not have diabetes mellitus, 71 (80.7%) and 17 (19.3%), respectively. Meanwhile, most patients who were not obese and experienced recurrent stroke ≤2 times and >2 times were 85 (83.3%) and 17 (16.7%), respectively. There was no association between diabetes mellitus, obesity, and recurrent strokes, with p-values of 1.000 and 0.457, respectively (p>0.05).

Discussion

The results of the study found that 88 (57.1%) post-stroke patients did not suffer from diabetes mellitus, as many as 71 (80.7%) patients experienced recurrent strokes ≤2 times, and 66 (42.9%) post-stroke patients with diabetes mellitus, as many as 54 (81.8%) patients experienced repeated strokes >2 times, the results of the analysis showed a p-value of 1.000 which means that there is no relationship between diabetes mellitus and the incidence of recurrent strokes. This research is in line with previous research conducted by several researchers that there is no relationship between diabetes mellitus and the incidence of recurrent strokes.[18,19]

Different studies show diabetes mellitus is a risk factor for intracranial stenosis. Diabetes increases the accelerated formation of atherosclerotic stenosis through a decrease in fibrinolytic activity. Based on this study, the odds ratio associated with diabetes mellitus ranges from 4 to 5.9.[20] Patients with intracranial atherosclerosis had a higher prevalence of diabetes mellitus (67%) than those with osteosclerosis extracranial atherosclerosis (60% and 48%, respectively).[11]

The systematic review and meta-analysis carried out summarize the available data on the effects of diabetes on stroke recurrence among patients with ischemic stroke and its subtypes. The study found a significant risk of stroke recurrence in ischemic stroke patients with diabetes compared to those who were not diabetic.[21] Of all the risk factors, the available data strongly link diabetes to the occurrence of stroke. Diabetes does not depend on other conventional risk factors for stroke (especially ischemic stroke) and provides a risk of more than two times for various vascular diseases. Says that people with diabetes mellitus are at risk of developing other diseases, including heart disease, peripheral artery disease, and cerebrovascular disease (stroke).[22]

The study results found that out of 154 respondents, as many as 102 (66.2%) respondents did not have obesity, and as many as 52 (33.8%) respondents were obese. Furthermore, it was found that out of 154 respondents, as many as 102 respondents who were not obese but suffered recurrent strokes ≤2 times as many as 85 (83.3%) and who had repeated strokes >2 times as many as 17 (16.7%), of the 52 respondents who had obese strokes and had repeated strokes ≤2

Table 3 Association between Diabetes Mellitus, Obesity, and the Incidence of Recurrent Strokes

Risk Factors	Recurrent Strokes				Total		α	p
	≤2 Times		>2 Times					
	n=154	%	n=154	%	n=154	%		
Diabetes mellitus								
None	71	80.7	17	19.3	88	100	0.05	1.000
Not none	54	81.8	12	18.2	66	100		
Obesity								
Not	74	84.1	14	15.9	88	100	66.2	0.457
Yes	85	83.3	17	16.7	102	100	33.8	

times as many as 40 (76.9%) and those who had repeated strokes >2 times as many as 12 (23.1%). The analysis results showed a value of p=0.457, which means there is no relationship between obesity and the incidence of recurrent strokes. Overweight and obesity are the accumulation of abnormal or excessive fat that poses a health risk. A person with a BMI of 30 kg or more is considered obese, and a BMI equal to or more than 25 kg is considered overweight.[23] Being overweight or obese is a significant risk factor for several chronic diseases, including diabetes, heart disease, and cancer.[24]

The results of this study are in line with research that has been conducted, which found that obesity is not a causal factor in recurrent strokes in patients.[25] However, the result of a different study concluded that obesity is a significant risk factor for recurrent stroke.[26] A healthy lifestyle including a high diet quality, and a high level of physical activity was shown to significantly reduce the risk of the incidence of recurrent strokes in patients.[17]

Conclusion

This study concluded that there was no association between diabetes mellitus, obesity, and the incidence of recurrent strokes in post-stroke patients at a regional general hospital in Aceh province.

Conflict of Interest

There is no conflict of interest in this study.

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