



Analysis of participants' characteristics and risk factors for stroke recurrence[☆]



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Abstract

Objective: This preliminary study aimed to identify risk factors contributing to recurrent stroke. **Method:** The study design was a descriptive analytic with a cross-sectional approach. The study involved post-stroke patients admitted to inpatient and outpatient of a neurology department. Ninety-eight participants were selected through consecutive sampling.

Results: The study results suggested that patients with a bachelor's degree (2%) had a lower risk of recurrent stroke, while housewives (32.7%), patients with ischemic stroke (63.3%), and patients with a second incidence of stroke (78.6%) had a higher risk for recurrent stroke. Risk factors for stroke included modifiable factors such as hypertension, cardiovascular disease, hypercholesterolemia, obesity, diabetes mellitus, smoking habit, alcohol abuse, stroke history, and use of contraceptive pills; and non-modifiable factors such as age, sex, ethnicity, and genetics. The results revealed that hypertension (86.7%), as a modifiable risk factor, posed the highest risk for recurrent stroke. Being of Javanese ethnicity (60.2%) was indicated as the non-modifiable risk factor with the highest risk of recurrent stroke.

Conclusion: Risk factors are firmly associated with stroke recurrence. It is necessary to investigate stroke patients' self-screening further to manage modifiable factors.

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Introduction

Stroke is generally defined as a cerebrovascular accident occurring when a thrombus blocks vessels carrying oxygen and nutrients to the brain or when there is a rupture in some area of the brain.¹ Stroke is also identified as the second leading cause of death globally after ischemic heart

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disease, especially in developing countries. There were around 6.2 million (10.6%) stroke incidents in 2011. Death is the direst consequence of stroke, and it also causes disability that results in loss of age potentials due to premature death and declined productivity.²

Stroke complications may be mitigated by controlling for risk factors, which are classified as modifiable or non-modifiable. Non-modifiable risk factors include age, sex, low birth weight, ethnicity, and genetics.³ The modifiable ones involve hypertension, diabetes mellitus, dyslipidemia, atrial fibrillation and other heart diseases, stenosis of arterial carotid, hormonal medications following menopause, use of oral contraceptives, smoking habit, alcohol consumption, unhealthy diet, obesity, and lack of physical activity.⁴ Stroke has a possibility of relapse or recurrence of 39.2%, and around 13% of stroke patients are affected by a recurrent stroke within their first year. In a recurrent stroke, greater neurological deficits may occur than in the first incident.⁵ Hospitals are currently dealing with the challenge of lowering the rate of preventable readmissions to save national budgets and improve the quality of services in hospitals.⁶ So far, there has been no study investigating modifiable and non-modifiable factors affecting recurrent stroke in Indonesia. Analysis of dominant factors contributing to stroke relapse may help nurses in preventing, educating, or providing care for patients following a stroke incident. Therefore, this preliminary study aimed to identify risk factors contributing to recurrent stroke.

Method

The study design was descriptive analytic with a cross-sectional approach. An analysis was performed to elaborate on the characteristics, and the most dominant factors contributing to recurrent stroke among post-stroke patients evaluated all together.⁷

The study population was 200 post-stroke patients who had survived the acute phase and were registered in outpatient departments and neurology polyclinics.

Three central hospitals in Jakarta were involved for data gathering. The inclusion criteria included stroke patients affected by recurrent stroke, the patient was able to communicate verbally, and patient consented to participate in this study.

Table 1 shows that 98 participants who met the inclusion criteria were selected through consecutive sampling.

Results

Table 2 shows that a majority of the participants with recurrent stroke were high school graduates (51%) and only a few held bachelor's degrees (2%). Housewives (32.7%) had the highest incidence of recurrent stroke among the occupations.

Most of the patients with recurrent stroke were diagnosed with an ischemic stroke (63.3%) rather than a hemorrhagic stroke (36.7%). The majority of the patients were affected by a second incident (78.6%) rather than a third or greater incident (21.4%).

Table 3 reveals that hypertension (86.7%) was the most dominant factor contributing to stroke recurrence among

Table 1 Distribution of participants based on education, occupation, medical diagnosis, and recurrent stroke in three hospitals (*n* = 200).

Variable	Category	<i>n</i>	%
Education	Bachelor graduate	15	7.5
	Diploma graduate	26	13.5
	High school graduate	78	39
	Middle school graduate	57	28.5
	Elementary school graduate	16	8
	No degree	8	4
	Total	200	100
Occupation	Civil servant	13	6.5
	Private worker	46	23
	Entrepreneur	60	30
	Housewife	52	26
	Unemployed	16	8
	Other	13	6.5
	Total	200	100
Medical diagnosis	Hemorrhagic stroke	79	39.5
	Ischemic stroke	121	60.5
	Total	200	100
Recurrent stroke	First incident	102	51
	Second incident	77	38.5
	Third incident or greater	21	10.5
	Total	200	100

Table 2 Distribution of participants based on education, occupation, medical diagnosis, and stroke incidence (*n* = 98).

Variable	Category	<i>n</i>	%
Education	Bachelor graduate	2	2
	Diploma graduate	11	11.2
	High school graduate	50	51.0
	Middle school graduate	21	21.4
	Elementary school graduate	11	11.2
	No degree	3	3.1
	Total	98	100
Occupation	Civil servant	6	6.1
	Private worker	24	24.5
	Entrepreneur	19	19.4
	Housewife	32	32.7
	Unemployed	13	13.3
	Other	4	4.1
	Total	98	100
Medical diagnosis	Hemorrhagic stroke	36	36.7
	Ischemic stroke	62	63.3
	Total	98	100
Recurrent stroke	Second incidence	77	78.6
	Third incidence or greater	21	21.4
	Total	98	100

the modifiable factors, followed by a sedentary lifestyle as the second most dominant factor (38.8%). Participants aged between 16 and 65 years old (67.3%) had the highest incidence of stroke recurrence, and Javanese ethnicity had a higher risk of stroke recurrence (60.2%). Males were more likely to be affected by recurrent stroke (56.1%) than females (43.9%). Participants with a family history of stroke

Table 3 Distribution of participants based on risk factors (*n* = 98).

Variable	Category	<i>n</i>	%
Hypertension	No	13	13.3
	Yes	85	86.7
	Total	98	100
Cardiovascular disease	No	81	82.7
	Yes	17	17.3
	Total	98	100
Hypercholesterolemia	No	56	57.1
	Yes	42	42.9
	Total	98	100
Obesity	No	75	76.5
	Yes	23	23.5
	Total	98	100
Smoking habit	No	87	88.8
	Yes	11	11.2
	Total	98	100
Alcohol consumption	No	93	94.9
	Yes	5	5.1
	Total	98	100
Activity	No	38	38.8
	Yes	60	61.2
	Total	98	100
Diabetes mellitus	No	52	53.1
	Yes	46	46.9
	Total	98	100
Use of contraceptive pill	No	90	91.8
	Yes	8	8.2
	Total	98	100
Age	18–65 years	66	67.3
	66–79 years	26	26.5
	80–89 years	6	6.1
	Total	98	100
Sex	Male	55	56.1
	Female	43	43.9
	Total	98	100
Ethnicity	Java	59	60.2
	Batak	11	11.2
	Kalimantan	1	1
	Sunda	23	23.5
	Betawi	1	1
	Manado	1	1
	Tionghoa	2	2
	Total	98	100
Family history of stroke	No	69	73.5
	Yes	29	26.5
	Total	98	100

were also more likely to be affected by a repeat stroke (26.5%).

Discussion

Based on the distribution of the participants' education, occupation, medical diagnosis, and stroke incidence shown in Table 2, the following factors were indicated: Educational background was among the critical factors because it influences how people perceive and manage their health issues.⁸

The table also shows that those with a bachelor's degree (2%) had the lowest risk of stroke recurrence. This result coincided with Telfair and Shelton,⁹ which claimed that individuals with lower levels of education were more likely to be affected by repeat stroke than those with higher education levels due to their extent of knowledge. This result contradicted with Ji Man Hon's study, which revealed no significant correlation between an individual's educational background and stroke incidence.¹⁰ Participants with a high school diploma had higher rates of stroke recurrence (51%), indicating that possessing adequate knowledge was not able to prevent a stroke relapse.¹¹ The results demonstrate that housewives had the highest incidence of stroke recurrence (32.7%), which might be caused by psychological stress or boredom in performing repeated daily activities.¹² Association AH claimed that stress might raise blood pressure due to the release of adrenaline and a faster heartbeat, leading to deterioration of atherosclerosis.¹ Another possible factor in housewives having the highest incidence of stroke recurrence is the performance of daily routines and activities that require less movement.¹³ Study results indicate that stroke recurrence is more likely to affect patients with ischemic stroke (63.3%) than patients with hemorrhagic stroke. The recurrence is mainly due to a higher prevalence of ischemic stroke. As stated by Hong, the prevalence of ischemic stroke saw an increase by up to 76%. A systematic review also claimed that patients with ischemic stroke had a higher prevalence of repeat stroke (33%) than those with hemorrhagic stroke (26.3%).¹⁴ More participants were affected by a second stroke incident (78.6%) than a third or greater incident. This result is in agreement with a study conducted by Johnston, which revealed that 15% of patients were affected by the second stroke within 90 days of the initial stroke incident.^{15,16} Junaidi also confirmed that 1 out of 10 stroke patients was affected by a repeat stroke within 6–12 months after the first stroke. Stroke recurrence depends on the type of the initial stroke, comorbidity, age, and individual risk factors.¹⁷

Risk factors for stroke are classified into modifiable and non-modifiable factors. Table 3 shows the results that reveal the following: The four diseases that predicted stroke recurrence were hypertension, diabetes mellitus, hypercholesterolemia, and cardiovascular disease. Hypertension had the highest incidence of repeat stroke (86.7%). These results correspond with AHA, which claimed a 70% prevalence of hypertension among stroke patients.¹⁸ Hypertension may accelerate atherosclerosis due to elevated pressure on the endothelial lining of arterial vessels, which promotes plaque formation. Higher blood pressure would also increase the risk of stroke recurrence.¹⁹ Junaidi described how uncontrolled hypertension might aggravate the process of atherosclerosis, which, in turn, leads to cerebral hemorrhage or infarction and altered autoregulation of vessels in the brain that pose a risk for stroke recurrence if left untreated.¹⁷ Diabetes is another factor contributing to repeat stroke due to a higher susceptibility to cerebrovascular diseases.²⁰ A systematic review defined diabetes as a strong risk factor of stroke due to its effect on the blood-brain barrier, microvascular complications, and an increased conversion of hemorrhagic infarction following reperfusion.²¹ Association A health determined that hypercholesterolemia is a risk factor for stroke that should be

taken into consideration because it may lead to blood clotting, which, in turn, can cause a stroke.²² Sandora confirmed this result and stated that 44.04% of stroke patients were affected by hypercholesterolemia. Cardiovascular disease was also indicated as a risk factor for recurrent stroke in which the formation of plaque occurs and occludes blood vessels in the brain.²³ A study by Gage determined cardiovascular disease was an independent risk factor contributing to stroke among male adults.²⁴ Lack of physical activity is also a risk factor with a significant percentage of occurrence when compared to other factors; it elevates blood pressure, predisposes the patient to diabetes mellitus, and causes weight gain, which may result in obesity.²⁵ Hickey defined obesity as a result of binge eating habits and inadequate exercise, causing metabolic disorders and elevated blood pressure; both are main indicators of stroke.²⁶ The result concurred with Strazzullo, which involved 2 million participants and revealed that obesity independently increased the risk of ischemic stroke threefold.²⁷ Participants with a smoking habit were also at risk for stroke recurrence, as confirmed by Lawrence, who showed that risk of stroke increased in proportion to the number of cigarettes consumed.²⁸ Alcohol abuse was also a modifiable risk factor of stroke recurrence and might increase the risk of all types of stroke.²⁹ Furthermore, the use of contraceptive pills also contributed to stroke recurrence among women. This result coincided with a study conducted by Putri, which revealed that 65.9% of 80 participants involved in the study were using oral contraceptives.³⁰ Age is among the non-modifiable risk factors for recurrent stroke. Blood vessels deteriorate with advancing age and double the risk of stroke in people aged 55 years or older. Although stroke generally affects older people, it may also affect people aged 65 years or younger.³¹ Males were more likely to be affected by stroke recurrence. This situation was presumably due to a lifestyle involving smoking, alcohol abuse, and dyslipidemia.³² Based on ethnicity, Javanese people had the highest risk of stroke recurrence. This result concurred with a study conducted by Erawantini, which indicated that among some ethnicities, the Javanese had the greatest tendency to be affected by stroke.³³ The tendency was associated with their local dietary habits and patterns. Based on heredity, there were only a few participants who were at risk for stroke recurrence. This result concurred with Haley and Roth's study, which suggested that family history was not considered an independent risk factor for stroke.³⁴ The study also indicated no significant correlation between family history and stroke incidence. However, another study claimed that an individual with a family history of stroke was more likely to be affected by stroke than those without a family history.³⁵

Stroke is a cerebrovascular disease with a globally high rate of morbidity, mortality, and disability. Therefore, it is imperative to stage screening and detection programs to prevent stroke by, for example, identifying the risk factors that are closely correlated with stroke recurrence. Risk factors for stroke are generally categorized into modifiable and non-modifiable, and it is necessary to investigate self-screening by stroke patients further to manage their modifiable risk factors. The author recommends that nurses be provided with health education that emphasizes the modification of patient behaviors to manage modifiable risk factors.

Conflict of interests

The authors declare no conflict of interest.

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