



INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT

ASSOCIATION BETWEEN STROKE RISK FACTORS AND ACUTE ISCHEMIC STROKE PROGRESSION IN HAJI ADAM MALIK GENERAL HOSPITAL

Winda Rahmah Darman*¹, Alfansuri Kadri² & KikingRitarwan²

*¹Resident Neurology Universitas Sumatera Utara / Haji Adam Malik Hospital Medan

²Staff of the Department of Neurology, Universitas Sumatera Utara / Haji Adam Malik Hospital Medan

DOI:

Keywords: acute stroke, ischemic, stroke risk factors, stroke progression.

Abstract

Background : Stroke is the leading cause of death and long-term disability in the world. Risk factors for stroke can affect the progression of acute ischemic stroke.

Objective : To determine the association between types of risk factors and the progression of acute ischemic stroke patients at Haji Adam Malik General Hospital Medan.

Research : This study uses a cross-sectional design in acute ischemic stroke patients at the General Hospital of Haji Adam Malik Medan. A non-contrast head scan was performed to diagnose acute ischemic stroke, the National Institute of Health Stroke Score of patients entered and the fifth day was calculated. Data analysis using chi square test and kruskal wallis test.

Results : The study involved 45 acute ischemic stroke patients consisting of 22 (48.9%) men and 23 (51.1%) women, with a median value of 59 years, and an age range of 20-84 years. There were 44 patients (97.8%) with a history of hypertension, 17 patients (37.8%) with diabetes mellitus, 38 patients (84.4%) with dyslipidemia, 6 patients (13.3%) with heart disease and 35 patients (77.8 %) with the frequency of first stroke. Statistical analysis showed a significant relationship between age (p value 0.002), hypertension (p value 0.036), dyslipidemia (p value 0.038) and heart disease (p value 0.033) with the progression of acute ischemic stroke

Conclusion : There is a significant association between risk factors and the progression of acute ischemic stroke in age, hypertension, dyslipidemia and heart disease.

Introduction

Stroke is a neurological syndrome which is a global health problem, a major cause of disability, and a leading cause of mortality worldwide. Globally, 15 million people suffer strokes every year. Where 5 million died and the remaining 5 million have a permanent record which puts a burden on the family and community. ¹

From data from the *World Health Organization* (WHO) it is known that as many as 30% of total deaths in the world are caused by heart disease and stroke. Recently in the United States, strokes declined by around 60% and became the fourth leading cause of death from heart disease, malignancy, and chronic lower respiratory tract disease during the last 30 years. ²

It is known that there are no specific medical procedures that contribute to the quality of life in old age as prevention and reduce the incidence of stroke. Some risk factors are divided into two, namely, can be modified including hypertension, dyslipidemia, smoking, gout, obesity and diabetes mellitus, while those that cannot be modified are age, sex, family history, and previous stroke. ³

Ischemic stroke progression occurs in all patients whose deficits are not maximal and progression occurs at the same time. The word progressivity is commonly used in clinical deterioration. Clinical progression or worsening refers to the patient's brain function. ⁴

The purpose of this study was to determine the relationship between types of risk factors and the progression of acute ischemic stroke patients at H. Adam Malik General Hospital Medan.



Methods

Research subject

Research subjects were taken from the hospital patient population. Determination of research subjects is carried out according to the method of *non-random sampling* consecutively. The inclusion criteria in this study were age ≥ 18 years old, all patients with acute phase ischemic stroke treated in the inpatient room of Haji Adam Malik General Hospital Medan and agreeing to participate in the study was proven by filling in *informed consent* both directly and represented by the patient's family. The minimum sample for this study was 45 people.

Research design

This research is descriptive with a prospective data collection method without treatment on primary data sources obtained from all ischemic stroke sufferers in the Haji Adam Malik Hospital in Medan. Then the examination, Blood Pressure, Blood Glucose Level, Lipid Profile, and NIHSS examination the first day entered and the fifth day.

Statistical Analysis

Research analysis data will be analyzed statistically with the help of the *Windows SPSS (Statistical Product and Science Service)* computer program version 22.0.

Result

This research was conducted at the Department of Neurology, Haji Adam Malik General Hospital, Medan in 2019. The total subjects were 45 people. The distribution of the research sample by sex was found in 23 women (51.1%) and 22 men (48.9%). Other characteristics are also seen by age group. Research subjects were distributed based on 5 age groups. The age group of 18-30 years was found as many as 4 people (8.5%), for the age group > 30-40 years as many as 3 people (7.5%), the age group > 40-50 years were 4 people (8.5%), the age group > 50-60 years were 18 people (40%) and the last age group > 60 years were 16 people (35.5%). This study will find out several risk factors for the progression of ischemic stroke. Some risk factors examined in this study are gender, age, hypertension, diabetes mellitus, dyslipidemia, heart disease, and frequency of stroke. The following is a frequency distribution based on risk factors. Of all study subjects, patients with hypertension were 44 people (97.8%), 17 people (37.8%) diabetes mellitus, 38 people dyslipidemia (84.4%), 6 people heart disease (13.3%), and risk factors based on the frequency of the first attack as many as 35 people (77.8%).



Table 1. Characteristics of Demographics

Demographic Characteristics	Ischemic stroke
Sex	
Men	22 (48.9%)
Women	23 (51.1%)
Age	
18-30	4 (8.9%)
31-40	3 (6.7%)
41-50	4 (8.9%)
51-60	18 (40%)
> 60	16 (35.5%)
Age, Median (Min-Max)	59 (20-84)
Tribes	
Aceh	4 (8.9%)
Batak	19 (42.2%)
Java	7 (15.6%)
Karo	13 (28.9%)
Minang	2 (4.4%)
Education	
Elementary school	8 (17.8%)
Middle School	5 (11.1%)
High school	27 (60%)
College	5 (11.1%)
Profession	
IRT	9 (20%)
College student	2 (4.4%)
Fisherman	1 (2.2%)
Farmers	11 (24.5%)
Civil servants	10 (22.3%)
Private employees	1 (2.2%)
TNI / POLRI	2 (4.4%)
entrepreneur	9 (20%)
Risk Factors	
Hypertension	44 (97.8%)
Diabetes mellitus	17 (37.8%)
Dyslipidemia	38 (84.4%)
Heart disease	6 (13.3%)
Stroke Frequency 1x	35 (77.8%)
NIHSS Day 0, Median (Min-Max)	8 (1-23)
NIHSS Day 5, Median (Min-Max)	8 (0-24)

In table 2, it is found that there are 1 man patient who have improved, there are still 21 patients, and those with worsening are absent and there are a total of 22 men patients. While for women that experienced improvement there were 5 patients, there were still 17 patients, and those who experienced worsening there were 1 patient and a total of 23 patients were women. This study shows that there was no significant association between sex and the progression of acute ischemic stroke in Haji Adam Malik General Hospital with p value = 0.131.



Table 2. Association of Sex with Ischemic Stroke Progressivity

Sex	Repair	Permanent	PP Bad	p value
Men	1	21	0	.131
Women	5	17	1	

Chi Square Test

In table 3 we can see that age is seen at 18 to 30 years old, there are 3 patients, there is still 1 patient, and there are no subjects who experience worsening, then for ages over 30 to 40 years who experience improvement there is 1 patient, which remains 2 patients, and none experienced worsening, then for those aged over 40 to 50 years who experienced improvement there was 1 patient, there were still 3 patients, and those who experienced worsening did not, then for those aged over 50 to 60 years who experienced improvement there 1 patient, 17 patients remained, and those with worsening were absent, then for those aged over 60 who experienced no improvement, 15 patients remained, and 1 patient had worsening. This study shows that there was a significant association between age and the progression of acute ischemic stroke in Haji Adam Malik General Hospital with p value = 0.002.

Table 3. Association of Age Groups with Ischemic Stroke Progressivity

Age group	Repair	Permanen t	Worsening	p value
18-30	3	1	0	0.002
31-40	1	2	0	
41-50	1	3	0	
51-60	1	17	0	
> 60	0	15	1	

Kruskal-Wallis Test

Table 4 shows that there are 44 patients with hypertension, 5 patients have improvement, there are still 38 patients, and 1 patient has worsening, for 1 patient who does not have hypertension, only 1 patient and the patient has improvement. This research shows that there was a significant association between hypertension and the progression of acute ischemic stroke in Haji Adam Malik General Hospital with p value = 0.036.

Table 4. Association of Hypertension with Ischemic Stroke Progressivity

Hypertension	Repair	Permanent	Worsening	p value
Yes	5	38	1	0.036
No	1	0	0	

Chi Square Test

Table 5 shows that 17 patients who had diabetes mellitus had 1 patient who experienced improvement, 15 patients who remained, and 1 patient who experienced worsening, and from 28 patients who did not have diabetes mellitus there were 5 patients who experienced improvement, 23 patients still, and none of the patients experienced worsening. There was not a significant association between diabetes mellitus and the progression of acute ischemic stroke in Haji Adam Malik General Hospital with p value = 0.243.

Table 5. Relationship of Diabetes Mellitus to the Progressivity of Ischemic Stroke

Diabetes mellitus	Repair	Permanent	Worsening	p value
Yes	1	15	1	.243
No	5	23	0	

Chi Square Test



INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT

Table 6 shows that of 38 patients who had dyslipidemia there were 6 patients who experienced improvement, 32 patients who remained, and no patients who experienced worsening, and from 7 patients who did not have dyslipidemia there were no patients who experienced improvement, 6 patients remained, and 1 patient who experienced worsening. In this study, there was a significant association between dyslipidemia and the progression of acute ischemic stroke in Haji Adam Malik General Hospital with p value = 0.038.

Table 6. Relationship of Dyslipidemia to Ischemic Stroke Progressivity

Dyslipidemia	Repair	Permanent	Worsening	<i>p</i> value
Yes	6	32	0	0.038
No	0	6	1	

Chi Square Test

Table 7 shows that out of 6 patients who have heart disease, 1 patient experienced improvement, 4 patients who remained, and 1 patient who experienced worsening, and from 39 patients who did not have heart disease, 5 patients experienced improvement, 34 patients remained, and no patients experienced worsening. This research shows that there was a significant association between heart disease and the progression of acute ischemic stroke in Haji Adam Malik General Hospital with p value = 0.033.

Table 7. Relationship of Heart Disease with Ischemic Stroke Progressivity

Heart disease	Repair	Permanent	Worsening	<i>p</i> value
Yes	1	4	1	0.033
No	5	34	0	

Chi Square Test

In table 8 it is found that one of the risk factors for ischemic stroke above, it can be seen that of the 35 patients who had a stroke frequency first time, there were 5 patients who experienced improvement, 29 patients who remained, and 1 patient who experienced worsening, and from 10 patients who experienced worsening. had a stroke frequency of more than one time, there was 1 patient who experienced improvement, 9 patients remained, and no patient experienced worsening. In this study, there was no significant association between heart disease and the progression of acute ischemic stroke in Haji Adam Malik General Hospital with p value = 0.803.

Table 8 Relationship of Stroke Attack Frequency with Ischemic Stroke Progressivity

Frequency of stroke	Repair	Permanent	Worsening	<i>p</i> value
1x	5	29	1	.803
> 1x	1	9	0	

Chi Square Test

Table 9 shows that of the 3 patients who had 1 risk factor who experienced no improvement, there were still 3 patients and those who experienced worsening did not exist temporarily for 42 patients who had multifactorial improvement, there were 6 patients, there were still 35 patients, and one patient experienced worsening. In this study, there was no significant association between multifactorial risk and the progression of acute ischemic stroke in Haji Adam Malik General Hospital with p value = 0.744.

Table 9 Relationship between the Number of Risk Factors and Ischemic Stroke Progressivity

Risk Factors	Repair	Permanent	Worsening	<i>p</i> value
1 factor	0	3	0	0.744
Multifactorial	6	35	1	

Chi Square Test



Discussion

In this study the number of research subjects was 45 people in which the sample which was the subject of this study were patients aged ≥ 18 years, all patients with acute phase ischemic stroke treated in the inpatient room of Haji Adam Malik General Hospital Medan, and agreed to participate in the study was proven by filling in *informed consent* both directly and represented by the patient's family. Exclusion criteria in this study were hemorrhagic stroke sufferers, acute ischemic stroke sufferers with chronic kidney disease, acute ischemic stroke sufferers with sepsis and acute ischemic stroke sufferers with pneumonia.

The first risk factor examined in this study is sex. The analysis showed that there was no significant association between sex and the progression of ischemic stroke (p value 0.131; p value > 0.05). The role of sex in the progression of ischemic stroke is inseparable from hormonal factors. The present study has the same analysis as the study which shows that there is no significant difference between sex factors and the progression of ischemic stroke. *American Heart Association* also conducted the same research and showed that sex is inseparable from aging. At a young age, several studies say women have a greater risk of stroke than men and in old age men will have a greater risk for progressivity. The study states that this condition is also inseparable from the hormonal actors. However, from several studies it can be concluded that for the sex themselves without looking at hormonal factors and age cannot be used as a risk factor for the progression of ischemic stroke.^{5,6}

For the second risk, this study looks at age as a risk factor for the progression of ischemic stroke. In this study the age of the research subjects was collected into 5 age groups. Ages 18-30 years, $> 30-40$ years, $> 40-50$ years, $> 50-60$ years and last > 60 years. In this study, a significant association between age and ischemic stroke progression was found (p value 0.002; p value < 0.05). This result is in accordance with a study with the results of age greatly affect the progression of ischemic stroke, especially neurological symptoms in a disease. At the age of 51-84 in 78 research subjects showed progressively more severe. It is known that getting older naturally increases the degenerative activity of nerve fibers. As we get older, coagulation factors are also found and some hemostasis factors are also increasing which are influenced by several factors that will cause occlusion in some blood vessels that provide vascularization in nerve fibers.⁷

Hypertension, is the most common risk factor in cerebrovascular disease. In several studies, it is not uncommon for this condition to be found to be a major cause, especially in hemorrhagic strokes. In this study, we found the same analysis results in many studies, that hypertension has a significant association with the progression of ischemic stroke. This condition is in accordance with a study with the results found in all samples of subjects with ischemic stroke 84% of patients who experience hypertension have progressively worse ischemic stroke progression. Increased blood pressure will increase vascular resistance and will reduce blood flow to the brain, causing ischemia in some nerve cells. The use of antihypertensive is highly recommended in patients with ischemic stroke.⁸

The next risk factor investigated is diabetes mellitus. No significant association was found between diabetes mellitus and the progression of acute ischemic stroke in H. Adam Malik General Hospital Medan (p value : 0.243; p value > 0.05). The severity of early hemorrhagic or ischemic stroke and poor functional outcome did not differ significantly between DM and non-DM patients.⁹ Diabetics who suffer from a stroke seem to benefit and improve as long as the acute rehabilitation period remains at a level equivalent to patients who are not diabetic.¹⁰

The next factor analyzed as progression from ischemic stroke is dyslipidemia. In this study, a significant association between dyslipidemia and the progression of ischemic stroke was found (p value : 0.038; p value < 0.05). Dyslipidemia is a metabolic disorder of cholesterol which is also characterized by an increase in LDL, triglycerides and a decrease in HDL. Previous studies have shown that dyslipidemia, especially elevated LDL, is a factor that can *independently* increase the progression of ischemic stroke in women. Of the 296 stroke and control patients, it was found that total cholesterol, triglycerides and HDL cholesterol were associated with the risk of ischemic stroke, although a high ratio of total HDL cholesterol / cholesterol increased the risk.¹¹

Heart disease was found to be significant associated to the progression of ischemic stroke when analyzed in this



INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT

study, (p value 0.033; p value <0.05). In accordance with studies conducted by Ernest Palomers et al, that heart disease is a major risk factor for the progression of ischemic stroke. Progressivity is increasing, especially in coronary heart failure. Coronary heart disease, especially in left ventricular damage will cause pump failure and cause significant ischemic activity in the brain. Congestive heart failure is also a risk factor for progression. Atrial fibrillation which is often found in heart failure will also increase the incidence of thromboembolism which will worsen ischemic stroke.¹²

The frequency of a stroke is the number of strokes commonly called a stroke *recurrence*. The definition of stroke *recurrence* is the understanding of ischemic stroke plus additional criteria : there must be a new neurological deficit or worsening of the previous deficit that is not due to edema, hemorrhagic transformation, or recurring disease. In this study no significant association was found between the frequency of ischemic stroke with ischemic stroke progression (p value 0.803; p value >0.05). In women, with risk factors for hypertension without heart disease have better survival than those who have heart disease. In this study, no relationship was found between the frequency of strokes and the progression of acute ischemic stroke which can be caused by the small number of patients who have heart disease.^{13,14}

Multiple risk factors analyzed did not have a significant association with the progression of ischemic stroke in this study (p value 0.744; p value >0.05). The results of the insignificant analysis in this study were also caused by the identification of the treatment status of each risk factor enough to affect the patient's progression. Adequacy and treatment status need to be identified and adjusted for progression scores. The results given are also more thorough and representative of all multiple risk factors. From another study of 425,600 Chinese people with or without atrial fibrillation, in stroke patients with multiple risk factors. In this study it is said that multiple risk factors have the potential 4 times more often to increase progression if accompanied by atrial fibrillation, so that multiple risk factors are not absolutely a cause of ischemic stroke progression.^{6,15}

Conclusion

There is a significant relationship between several types of risk factors with the progression of acute ischemic stroke.

References

- [1] Lahano AK, Chandio MA, and Bhatti MI. Frequency of Stroke In Hypertensive Patients. Professional Medical Journal. 2014. 21(3): 484-488.
- [2] Yikilkan H, Serini K, Aypak C, and Gorpelioglu S. Comorbid Disease and Dyslipidemia Among Elderly Home Care Stroke Patients. ActaMedica: 2013. 2 : 28-52.
- [3] Sorganvi V, Kulkarni MS, Kadeli D, Atherga S. Risk Factors For Stroke: A Case Control Study. International Journal of Current Research and Review; 2014. 6 (3): 46-52.
- [4] Caplan LR. Basic Pathology, Anatomy, and Pathophysiology of Stroke. In : Caplan's Stroke : A Clinical Approach. 4th ed. Saunders. Elsevier. Philadelphia. 2009. Pp. 22-60.
- [5] Osama A, Hagar A, Al-Sayed R, Nigm M, and Youssef I. Progressive Ischemic Cerebrovascular Stroke: Frequency and Predictive Factors. Egypt J. Neurol. Psychiat. Neurosurg. 2007. 44(2) : 535-544.
- [6] Boehme A, Esenwa C, and Elkind M. Stroke Risk Factors, genetics, and Prevention. American Heart Association. 2017. 120 : 472-495.
- [7] Sumer M, Ozdemir I, and Erturk O. Progression in Acute Ischemic Stroke : Frequency, Risk Factors and Prognosis.2003. 10(2) : 177-180.
- [8] McManus M, and Lebieskind D. Blood Pressure in Acute Ischemic Stroke. Clin Neurol. 2016. 12(2) : 137-146.
- [9] Karapanayiotides, T., Piechowski-Jozwiak, B., Van Melle, G., Bogousslavsky, J., Devuyst, G., 2004. Stroke patterns, etiology, and prognosis in patients with diabetes mellitus. 2004. Neurology :62:1558-1562.
- [10] Ripley, DL., Seel RT., Macciocchi SN., Schara SL., Raziano K., Ericksen JJ. 2007. The Impact of Diabetes Mellitus on Stroke Acute Rehabilitation Outcomes. American Journal of Physical Medicine & Rehabilitation. 86(9) : 754-761.



INTERNATIONAL JOURNAL OF RESEARCH SCIENCE & MANAGEMENT

- [11] Bowman TS, Sesso H D, Ma J, Kurth T, Kase CS, Stampher MJ et al. Cholesterol and The Risk of Ischemic Stroke. *Stroke*. 2003. 34 : 2930-2934.
- [12] Ernest P, Virginia C. Epidemiology and Risk Factors of Cerebral Ischemia and Ischemic Heart Diseases: Similarities and Differences. *Current Cardiology Reviews*: 2010. 138-149p.
- [13] Hillen T, Coshall C, Tilling K, Rudd AG, McGovern R, and Wolfe CD. Cause of Stroke Recurrence is Multifactorial. *Stroke*. 2003. 34 : 1457 -1463.
- [14] Sacco RL, Kasner S E, Broederick JP, Caplan LR, Culebras A, Elkind, MSV, et al. An Update Defenition of Stroke for The 21st Century: a Statement for Healthcare Professionals from the American Heart Association / American Stroke Association. *Stroke*. 2013. 44 : 2064-2089.
- [15] Guo Y, Wang H, Tian Y, Wang Y, and Lip GYH. Multiple risk factors and ischaemic stroke in the elderly Asian population with and without atrial fibrillation. *Schautter*. 2016. p: 184-191.