

Characteristics and Risk Factors of Patients with Acute Ischemic Stroke in Dr. Hasan Sadikin General Hospital Bandung, Indonesia

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Abstract

Background: Stroke is the second most common cause of death globally and the third most common cause of disability. The prevalence of stroke is increasing despite managing various stroke risk factors that have improved considerably. Ischemic stroke is the most prevalent type, and about 90% of stroke events are attributable to modifiable risk factors. This study aimed to explore the characteristics and risk factors of patients with acute ischemic stroke in Dr. Hasan Sadikin General Hospital.

Methods: A descriptive cross-sectional study was conducted retrospectively in October 2020, using a total sampling method on medical records of acute ischemic stroke patients in Dr. Hasan Sadikin General Hospital year 2019. Medical records with incomplete and missing data were excluded. Demographic and known risk factors data were collected and presented in the table.

Results: Of the 355 subjects, male patients (n=69, 76.7%) were predominant, with the age range of 55–64 years old (36.1%). The majority of the subjects had an ischemic stroke of large-artery atherosclerosis (68.2%) with carotid system involvement (93.2%). As much as 305 subjects (85.9%) had hypertension as the risk factor, followed by dyslipidemia (47.3%), heart disease (39.4%), previous stroke history (33.8%), smoking (25.6%), diabetes mellitus (24.5%), hyperuricemia (12.1%), and blood disorders (2.3%).

Conclusions: Males in the older age group have a higher risk of getting acute ischemic stroke with ischemic stroke of large-artery atherosclerosis and carotid system involvement, and hypertension has the highest prevalence.

Keywords: Acute ischemic stroke, characteristics, hypertension, risk factors

Introduction

World Health Organization (WHO) describes stroke as clinical manifestation of focal or global cerebral dysfunction, which develops rapidly, lasts over 24 hours, that may lead to death, with no apparent cause apart from that of vascular origin.¹ Stroke is the second most common cause of death and the third most common cause of disability globally.² In Indonesia, the prevalence of stroke is rising from the previously reported seven per thousand population in Indonesia basic health research (*Riset kesehatan dasar*, Riskesdas) 2013 to 10.9 per thousand population reported in Riskesdas 2018.^{3,4} Ischemic stroke is the most prevalent type of stroke, encompassing about 75% of all stroke incidents in Asia and

67.1% of those in Indonesia.^{5,6}

Various risk factors can affect infarction that disrupts blood flow to the brain. Such factors can be generally classified into non-modifiable risk factors such as age, gender, family history of stroke, race, and modifiable risk factors including, hypertension, diabetes mellitus, cardiovascular disease, dyslipidemia, smoking, obesity, diet, physical inactivity, and alcohol consumption. About 90% of stroke cases are attributable to modifiable risk factors.^{7,8}

The development of today's medical sciences and practices indeed brings improvement in managing various risk factors for ischemic stroke. This condition should be followed by a decrease in the incidence of ischemic stroke. However, the incidence of

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ischemic stroke did not decrease over time. The best strategy to control the incidence rate of ischemic stroke is primary prevention through early detection and intervention of the risk factors.⁷ Knowing risk factor of ischemic stroke could help the preventive programs. There are no recent studies about risk factor characteristic of ischemic stroke in West Java. The aim of this study was to have an overview of patient characteristics and risk factors for acute ischemic stroke in West Java by using data from Dr. Hasan Sadikin General Hospital Bandung in 2019 as a top-referral hospital in West Java, Indonesia.

Methods

A descriptive study was conducted retrospectively using a cross-sectional study method in October 2020. Secondary data were obtained from the resume of medical records in the Neurology Ward of Dr. Hasan Sadikin General Hospital using total a sampling method. The subjects in this study were all medical records that met the inclusion criteria, including a diagnosis of ischemic stroke for 2019. Medical records with incomplete and missing data were excluded.

The variables in this study were age,

sex, ischemic stroke subtype based on etiology, vascular system involvement, and risk factors. Ages were grouped into 15–24, 25–34, 35–44, 45–54, 55–64, 65–74, and ≥75 years old, aimed to provide a better description regarding the increasing ischemic stroke cases for each additional 10 years of age from the early adult period. Ischemic stroke subtypes based on etiology were categorized into large-artery atherosclerosis (embolus/thrombosis), cardioembolism, small-vessel occlusion (lacune), and strokes of undetermined etiology. The vascular system involvement was classified into the carotid and vertebrobasilar systems. The data collected included known risk factors such as hypertension, diabetes mellitus, smoking, dyslipidemia, heart diseases, previous stroke history, hyperuricemia, and blood disorders. Heart diseases encompass coronary heart disease, rheumatic heart disease, and heart rhythm abnormalities or cardiac arrhythmias. Blood disorders comprise thrombocytopenia, hypercoagulability, and polycythemia vera.

The data were processed descriptively using Microsoft® Excel 2016. The data were then presented in tables for the frequency and percentage distribution. This study was approved by the Research Ethics Committee

Table 1 Characteristics of Patients with Acute Ischemic Stroke in West Java from Dr. Hasan Sadikin General Hospital Bandung Year 2019 (n=355)

Characteristics	n	(%)
Age (years)		
15–24	2	0.6
25–34	1	0.3
35–44	28	7.9
45–54	67	18.9
55–64 *	128	36.1
65–74	88	24.8
≥75	41	11.5
Gender		
Male*	183	51.5
Female	172	48.5
Ischemic stroke subtypes		
Large-artery atherosclerosis *	242	68.2
Cardioembolism	98	27.6
Small-vessel occlusion (lacune)	12	3.4
Undetermined etiology	3	0.8
Vascular involvement		
Carotid system *	331	93.2
Vertebrobasilar system	24	6.8

Note. * The most prevalent frequency

Table 2 Distribution of Risk Factors for Acute Ischemic Stroke in West Java from Dr. Hasan Sadikin General Hospital Bandung in 2019

Risk Factors	n	(%)
Hypertension	305	85.9
Dyslipidemia	168	47.3
Heart diseases	140	39.4
Previous history of stroke	120	33.8
Smoking	91	25.6
Diabetes mellitus	87	24.5
Hyperuricemia	43	12.1
Blood disorders	8	2.3

of Universitas Padjadjaran with an ethical exemption letter number 834/ UN6.KEP/ EC/2020.

Results

There were 361 cases of acute ischemic stroke in the Neurology Ward of Dr. Hasan Sadikin General Hospital from January to December 2019. Six data were excluded due to incompleteness, resulting in 355 subjects that were eligible for the study. It was found that the prevalence of ischemic stroke tends to increase with age, with the peak prevalence in the 55–64 year age group (36.1%). Based on gender, ischemic stroke was more common in males (51.5%). Ischemic stroke of large-artery atherosclerosis was the most prevalent subtype (68.2%), followed by cardioembolism (27.6%), small-vessel occlusion (lacune) (3.4%), and strokes of undetermined etiology (0.8%). In terms of vascular involvement in ischemic stroke, it was found that carotid system involvement was more common (93.2%) than vertebrobasilar system involvement (Table 1).

Risk factors analysis showed that 85.9% had hypertension, 47.3% had dyslipidemia, 39.4% had heart disease, 33.8% had a previous stroke history, 25.6% were active smokers or had a history of smoking, 24.5% had diabetes mellitus; while hyperuricemia was detected in 12.1%, and blood disorders only in 2.3%, as shown in Table 2.

Discussions

Ischemic stroke has been associated with both non-modifiable and modifiable risk factors. Age is one of the non-modifiable risk factors.

The incidence and risk of stroke increase with age, an estimated two-fold increase for each decade after 55 years of age.⁷ A report from the American Heart Association (AHA) suggests that ischemic stroke incidence is decreased significantly in people ≥ 60 years old. This may be related to the population's life expectancy, where the total population tends to decrease with age.⁹ In agreement with these statements, this study found that the prevalence of ischemic stroke tends to increase with age which it starts to increase significantly in the age group of 35–44 years. The prevalence peaks in the age group of 55–64 years and then tends to decrease in the subsequent groups. This finding is in accordance with a study conducted in Bali which reported similar results.¹⁰ The increase in the incidence of ischemic stroke in the elderly correlated with the cumulative effect of aging or degeneration of body organs, including the cardiovascular system, accompanied by increased risk factors such as hypertension and diabetes mellitus, causing susceptibility to ischemic stroke.^{7,10}

In general, men tended to have a higher incidence of ischemic stroke than women. However, in our study, the difference was narrow.^{9,11} A study conducted in Saudi Arabia shows that ischemic stroke is more common in men than women.¹² This is consistent with the finding of this study, where the ischemic stroke is more commonly found in male than female patients, with only a subtle difference. This finding is also in line with the previous studies conducted in Manado and Bali.^{10,13} Normal estrogen level in premenopause women has a protective effect against stroke, leading to a lower risk of stroke compared to men in younger and middle-aged groups. However, the risk tends to be higher at an elderly age.¹⁴

The previous study demonstrated that the ischemic stroke's cardioembolic subtype is the most prevalent, followed by large-artery atherosclerosis and lacunar stroke.¹⁵ Interestingly, our study showed that ischemic stroke from large-artery atherosclerosis was the most prevalent, followed by cardioembolic and lacunar stroke. This finding is in line with a study conducted in Jakarta.¹⁶ A study conducted in South Korea reported that carotid vascular system is more frequently involved in ischemic stroke than the vertebrobasilar system.¹⁷ Similarly, our study shows that the carotid vascular system involvement is more frequently found.

The leading risk factors for stroke in Indonesia, based on the study in 2015, were age, coronary heart disease, diabetes mellitus, hypertension, and heart failure.⁸ Hospital-based study in Jakarta showed that hypertension, dyslipidemia, and diabetes mellitus are the most prevalent risk factor for ischemic stroke.¹⁶ Another hospital-based study conducted in Egypt demonstrated that the most common risk factor for ischemic stroke was hypertension, followed by dyslipidemia and smoking.¹⁸ Not much different result in this study, where hypertension, dyslipidemia, and heart diseases were found to be the most prevalent risk factors. From those findings, hypertension consistently with being the most prevalent risk factor for ischemic stroke, while the distribution of the other risk factors tends to be slightly different in each study. As much as 85.9% of subjects in this study had a prior history of hypertension. This finding is also similar to studies conducted in Sleman and Manado, where a high prevalence of stroke was associated with hypertension.^{7,13} Hypertension is characterized by increased blood pressure leading to high intraluminal pressure. These mechanical changes altered the endothelium and vascular smooth muscle. When blood cells interact with the altered endothelium, a local thrombus is formed, and atherosclerosis formation is accelerated. This condition increases the risk of cerebral ischemic lesions due to local thrombosis as well as embolism originating from the distal vessels.¹⁹ According to Riskesdas 2018, the prevalence of hypertension in Indonesia is 34.1%, of whom 13.3% did not take any medication, while 32.3% did not regularly take medication.⁴ Along with the fact that hypertension is often asymptomatic, the patient neither recognized that they had hypertension nor sought any treatment. Thus, the hypertension was found together with complicated symptoms. This

situation indicates that the risk of ischemic stroke associated with hypertension in Indonesia might be high. A population-based study in the United States suggested that as many as 9% to 16% of all ischemic stroke cases might be avoided only by eliminating hypertension.²⁰ For that matter, early detection and management of risk factors may prevent the occurrence of ischemic stroke. Preventive interventions should be designed according to the current pattern of risk factors for ischemic stroke, especially those with high prevalence.

A retrospective study using data obtained from medical records, including this study, has various limitations, such as incomplete and missing data. Many other risk factors should be accounted for, such as behavioral factors (e.g., physical inactivity and unhealthy diet history), obesity, and a family history of stroke. However, the medical record needs to record complete information about these factors, limiting the possible risk factors in this study. Future studies should consider these other factors to better describe the current pattern of ischemic stroke risk factors.

In conclusion, ischemic stroke is found mainly in the 55–64 age group and is more common in males. Ischemic stroke of large-artery atherosclerosis is the most prevalent and commonly involves the carotid vascular system. A predominant risk factor is hypertension, thus suggesting that preventive actions against the modifiable risk factor should be prioritized.

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