



## Comparison of hypertension risk factors in Hemorrhic Stroke with Non-Hemorrhic Stroke in UKI General Hospital, East Jakarta

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### Abstract

Stroke is a disease that often causes death in Indonesia. Prevalence of stroke in Indonesia from Riskesdas 2007 is 8, 3 per 1000. This research aims to identify different hypertension as risk factors of ischemic and hemorrhagic stroke in inpatient patients of a stroke at UKI General Hospital 2017. The study was conducted by analyzing secondary data from patient medical records using a cross-sectional study. Results showed that there were patients with ischemic stroke (85,8%) and hemorrhagic (14,2%) with hypertension (74,02%), and characteristic age > 60 years (49,6%), male (59,1%), and most of them have been in senior high school or more (63,0%). Based on difference analysis, the result shows a statistical difference between the risk factor of hypertension and the incidence of ischemic and hemorrhagic stroke.

**Keywords:** stroke, risk factor, hypertension

### Introduction

The public health profile in industrialized countries has changed dramatically in the last half-century, causing Non-Communicable Diseases to become the leading cause of death globally. Chronic degenerative diseases such as heart disease and stroke are the most prevalent in the general and working populations. Changes in the pattern of the structure of Indonesian society into an industrial society have contributed to changes in lifestyle and socio-economics, which in turn can trigger an increase in non-communicable diseases. The change in the pattern of infectious diseases to non-communicable diseases is known as the epidemiological transition <sup>[1]</sup>. of the various types of non-communicable diseases in both developed and developing countries, heart disease and stroke occupy the top ranks as chronic diseases that cause the highest mortality worldwide <sup>[2]</sup>. There are 15 million people worldwide who suffer from stroke every year <sup>[3]</sup>.

Stroke is a blood vessel disorder or rupture of blood vessels in the brain so that the blood supply is disrupted and results in the death of brain cells because they do not get oxygen and nutrients. Stroke is a clinical sign that develops rapidly due to focal (or global) brain disorder with symptoms lasting 24 hours or more and can cause death or disability without any apparent cause other than vascular <sup>[4]</sup>.

Besides being the number one cause of disability globally, stroke is the second leading cause of dementia and the third leading cause of death after heart disease and cancer <sup>[5]</sup>. The four leading causes of global death in 2030 are ischemic heart disease, cerebrovascular disease (stroke), HIV/AIDS and chronic obstructive pulmonary disease (COPD) <sup>[6]</sup>.

Stroke cases are relatively high in developed countries like America, where obesity and fast food (junk food) have become epidemic. Based on statistical data in America, it is found that 700,000 people experience new or recurrent strokes every year <sup>[7]</sup>. It is recorded that every 45 minutes, there is one person in America who has a stroke. In 2010, Americans spent \$73.7 million to pay for medical expenses and rehabilitation due to stroke <sup>[8]</sup>. However, the mortality rate of stroke patients in America every year is 50-100 out of 100,000 sufferers <sup>[9]</sup>. In ASEAN countries, stroke is also a significant health problem that causes death. The incidence of stroke in developed countries tends to decrease due to primary prevention efforts against risk factors, while in developing countries, the incidence increases due to lifestyle changes <sup>[10]</sup>. Annually, approximately 5.8 million people die from stroke, and two-thirds of all stroke deaths occur in developing countries.

The incidence of stroke in Indonesia has increased sharply. The stroke problem is increasingly important and urgent because now the number of stroke sufferers in Indonesia is the highest and ranks first in Asia <sup>[11]</sup>. The largest stroke mortality rate occurred in Indonesia, followed by the Philippines, Singapore, Brunei, Malaysia, and Thailand. It is estimated that around 500,000 people in Indonesia suffer a stroke every year. Around 25% or 125,000 of these died, and the rest had mild or severe disabilities <sup>[12]</sup>. Data from the Ministry of Health of the Republic of Indonesia (Depkes RI) states that the causes of death for all ages are stroke (15.4%), tuberculosis (7.5%), and hypertension (6.8%) <sup>[13]</sup>. Regarding stroke in Indonesia, the prevalence of stroke in Indonesia is 6% or 8.3 per 1000 population whom health workers have diagnosed is 6 per 1000 population. It shows that around 72.3% of stroke cases in the community have been diagnosed by health workers. The prevalence of stroke based

on the diagnosis of health workers was highest in North Sulawesi (10.8%), followed by DI Yogyakarta (10.3%), Bangka Belitung and DKI Jakarta, each 9.7 per year <sup>[14]</sup>.

The number of someones who has a stroke in Indonesia is now increasing from year to year. This increase is not only affecting the elderly, but also young people of productive age. In 2020 it was estimated that 7.6 million people would die from stroke. The highest increase will occur in developing countries, especially the Asia Pacific. With these data, the government should make policies, such as the health department, to prevent an increase in the incidence of stroke in Indonesia.

Stroke is a multi-factorial disease with various causes accompanied by major clinical manifestations. Stroke can be divided into two parts: non-hemorrhagic stroke and hemorrhagic stroke. In western countries, of all recorded stroke patients, 80% are non-hemorrhagic strokes, while the rest are hemorrhagic strokes. Non-hemorrhagic stroke is a clinical sign of dysfunction or damage to brain tissue caused by a lack of blood flow to the brain, thereby interfering with the demand for blood and oxygen in the brain <sup>[15]</sup>. Of all stroke patients in Indonesia, non-hemorrhagic stroke is the most common type, which is 52.9%, followed sequentially by intracerebral haemorrhage, embolism and subarachnoid haemorrhage with incidence rates of 38.5%, 7.2 respectively. %, and 1.4% <sup>[16]</sup>.

Stroke risk factors are divided into non-modifiable risk factors and modifiable risk factors. The National Stroke Association (NSA) classifies age, gender, race, sodium, high cholesterol levels, diabetes, atherosclerosis, smoking, alcohol consumption, and obesity. The risk factors that trigger the high incidence of non-hemorrhagic stroke are non-modifiable risk factors such as age, race, gender, genetics, and history of Transient Ischemic Attack or previous stroke. Meanwhile, modifiable risk factors include hypertension, heart disease, diabetes, hypercholesterolemia, smoking, obesity, oral contraceptives, and alcohol. Hypertension is a problem that is often found in stroke patients and persists after a stroke.

In Indonesia, the age of stroke patients generally ranges from 45 years and over. A modern and instant lifestyle like today has a great opportunity for someone to have a stroke at a young age, both men and women of productive age. There are approximately 2 million people who survive a stroke and have some disability. The percentage of stroke patients were: Age 35-44 years 0.2%, Age 45-54 years 0.7%, Age 55-64 years 1.8%, Age 65-74 years 2.7%, Age 75-85 years 10.4% <sup>[17]</sup>. Prevention is one of the most effective and efficient ways to reduce the incidence of stroke. New prevention efforts can be made if we know what risk factors can cause a stroke. Therefore, knowledge of the risk factors that cause stroke is needed to formulate effective prevention methods. The world stroke organization noted that almost 85% of people who have risk factors could avoid stroke if they are aware of and overcome them early on. The world health agency predicts that deaths from stroke will increase along with deaths from heart disease and cancer from approximately six million in 2010 to eight million in 2030 <sup>[8]</sup>. Thus, identifying stroke risk factors is very important to control the incidence of stroke in a country. Therefore, the authors are interested in researching the comparison of risk factors for hypertension in hemorrhagic and non-hemorrhagic strokes at UKI General Hospital. The results of this study are expected to be useful for the formulation of stroke prevention and management programs in the future because based on the identification of these risk factors, prevention and control of stroke can be carried out, especially to reduce the incidence of stroke.

The formulation of the problem in this study is "Are there differences in the risk factors for hypertension in hemorrhagic stroke and non-hemorrhagic stroke?" with the aim of research to determine whether there are differences in the risk factors of hypertension in hemorrhagic and non-hemorrhagic stroke at the UKI General Hospital.

## Literature Review

The World Health Organization (WHO), quoted by Sacco *et al.* 1, defines stroke as a focal or global central nervous system disorder that occurs suddenly, lasts more than 24 hours or causes death, with no other cause other than vascular disorders. Stroke is a term used to describe neurological changes caused by inadequate blood supply to a part of the brain <sup>[18]</sup>. Stroke is also defined by Junaidi in Nastiti as an acute focal or global brain functional disorder with symptoms and signs according to the part of the brain affected, previously without warning, and can recover completely, heal with a disability, or die, caused by impaired blood flow to the brain. Brain due to bleeding or non-haemorrhage. There are two main classifications of stroke, namely ischemic stroke or non-hemorrhagic stroke and hemorrhagic this is based on the cause and pathophysiological findings, namely ischemic stroke (80%), hemorrhagic stroke or intracerebral haemorrhage (15%), and subarachnoid haemorrhage (5%) <sup>[19]</sup>.

Based on the World Stroke Organization (WSO), 1 in 6 people suffer from a stroke almost every 6 seconds, and someone dies from a stroke, which means that every year nearly 6 million people worldwide die from a stroke <sup>[3]</sup>. About 80% of strokes in western countries are caused by focal cerebral ischemia due to arterial occlusion, and 20% are due to haemorrhage <sup>[10]</sup>. The prevalence of stroke in Indonesia, according to Riskesdas in 2013, based on the diagnosis of health workers or symptoms, was 12.1 per mile <sup>[14]</sup>. Health workers have diagnosed a total of 57.9% of strokes. The prevalence of stroke appears to increase with the respondent's age, the highest at the age of 75 years (43.1% and 67.0%), and equally high in men and women <sup>[14]</sup>. Stroke risk factors can be categorized into modifiable and non-modifiable. Modifiable risk factors are hypertension, cholesterol, hyperglycemia, diabetes mellitus, obesity, heart disease, smoking, and blood clotting disorders. While the risk factors that cannot be modified are age, gender, race and family history <sup>[20: 21]</sup>.

Interruption of cerebral blood supply can occur anywhere in the arteries that make up the circle of Willis, namely the internal carotid artery and the vertebrobasilar system or all of their branches. If blood flow to the brain is stopped for 15 to 20 minutes, a tissue infarction will occur. The underlying pathological process can be: a) conditions within the vessel itself, such as atherosclerosis and thrombosis, tearing of the vessel wall, or inflammation; b) reduced perfusion due to impaired blood flow status, e.g. blood hyperviscosity shock; c) impaired blood flow due to an infectious clot or embolus originating from the heart of extracranial vessels, and d) vascular rupture within the brain parenchyma or subarachnoid.

Clinical manifestations of clients affected by stroke vary depending on the cause, the area of damaged neurons, the location of the affected neurons, and the condition of the cerebral collateral vessels. Manifestations of ischemic stroke include transient hemiparesis, loss of speech function and chemosensory loss. The blockage of cerebral blood vessels has several specific clinical features [22]: a) It occurs suddenly. Sudden onset of symptoms and rarely preceded by warning signs such as headache, nausea, vomiting, and so on; b) Shows neurologic symptoms contralateral to the occluded vessel. It is especially evident in diseases of the cerebral vessels of the carotid system; and c) Loss of consciousness to coma is rare, except in cerebral haemorrhage. In addition, cerebral artery occlusion can cause several symptoms, including contralateral hemiparesis (motor disturbances), hemianesthesia (sensory disturbances), hemianopsia (impaired half of the visual field), aphasia or dysphasia, spatial perception disorders, apraxia, apathy, and even coma.

Patients with ischemic embolic strokes and hemorrhagic strokes generally show a more severe clinical picture than thrombotic strokes because embolic strokes usually cause sudden neurological deficits with maximum effect since the onset of disease. In contrast, hemorrhagic strokes can quickly cause neurologic symptoms due to pressure on these structures. Nerves within the skull cause rapid deterioration of brain function and loss of consciousness, even rapid death compared to the gradual course of ischemic stroke [21]. In most cases of ischemic stroke, clear information about the location of the lesion in the brain can be obtained. However, in hemorrhagic stroke, various complications of brain bleeding often occur, which cause impaired brain function to also occur in areas other than the area where the bleeding occurred. It is caused by increased intracranial pressure, brain oedema, compression of brain tissue and blood vessels, and dispersal of blood that comes out in various directions. Therefore, localized focal symptoms usually occur in ischemic stroke, whereas in hemorrhagic stroke, focal symptoms are not so obvious and do not provide specific localization predictions. There are differences in the activities of daily living (Activity of Daily living) between post-hemorrhagic and non-hemorrhagic stroke patients, where post-stroke hemorrhagic patients have worse scores than post-stroke patients. non-hemorrhagic type [23].

The effects of a stroke include physical and psychological disorders. One of the physical effects of stroke is the disability, with the most common disability being referred to inpatient rehabilitation is the inability to walk safely without physical assistance. Six months after stroke, approximately 65% of patients cannot perform normal activities with both hands [24]. The average muscle strength in the extremities of stroke patients in the hands and feet indicates a decrease in muscle strength in stroke patients, resulting in hemiparesis or paralysis. At the same time, the psychological disorders that arise are mental changes, emotional disturbances, and depression. The likelihood of improvement after stroke varies based on the nature and severity of the initial deficit. Approximately 35% of patients with a first attack stroke experience paralysis of the limbs that cannot function again, and 20-25% of all sufferers cannot walk without physical assistance. About 20% of patients have impaired language expression and comprehension after stroke and should receive speech therapy. Only 25% of patients return to the same level of ability to carry out activities of daily living and physical function as non-stroke survivors [24].

Ischemic stroke or "brain attack" is a sudden loss of function due to interruption of blood supply to parts of the brain due to either partial or total blockage of the arteries. Ischemic stroke is defined as loss of neurological function due to sudden cessation of cerebral blood circulation [25] [60]. Ischemic stroke is also defined as an episodic neurological disorder resulting from a focal cerebral, spinal, or retinal infarct [17].

Hemorrhagic stroke occurs when an intracerebral vascular lesion ruptures, causing bleeding into the subarachnoid space or directly into brain tissue [25]. Intracerebral haemorrhage most often occurs when chronic high blood pressure weakens small arteries, causing them to tear. The use of cocaine or amphetamines can cause temporary but very high blood pressure and bleeding. In some older people, an abnormal protein called amyloid accumulates in the brain's arteries. This accumulation (called amyloid angiopathy) weakens the arteries and can cause bleeding [26]. Less common causes include blood vessel abnormalities at birth, wounds, tumours, inflammation of the blood vessels (vasculitis), bleeding disorders, and anticoagulants in excessively high doses. Bleeding disorders and anticoagulants increase the risk of death from intracerebral haemorrhage [26].

Comparison of Hypertension Risk Factors in Hemorrhagic and Non-Hemorrhagic Stroke - Several common risk factors can occur in hemorrhagic and ischemic stroke. Atrial fibrillation, ischemic heart disease, and diabetes with ischemic stroke appear to be well established in comparative studies, but the relative roles of risk factors such as hypertension, smoking, and alcohol consumption remain controversial [27]. Elevated blood pressure (BP) is a risk factor for cardiovascular disease. However, it is unclear whether systolic BP (SBP), diastolic BP (DBP), pulse pressure (PP), or mean arterial pressure (MAP) are most useful in predicting stroke incidence. In addition, the risk associated with measures of blood pressure may be different for the two main types of stroke, namely ischemic and hemorrhagic [28].

Knowledge about the relative role of risk factors in hemorrhagic stroke versus ischemic stroke is still inconsistent. In a population-based study conducted by Perth, hypertension and diabetes were more likely to trigger ischemic stroke, and high alcohol intake was more likely to cause hemorrhagic stroke, whereas smoking did not support a difference between the two types of stroke. In another population-based observational study, it was shown that increasing age, previous stroke, and diabetes were more likely to cause ischemic stroke, whereas ischemic heart disease, atrial fibrillation, hypertension, alcohol intake, and smoking did not favour either stroke type. Based on the hospital-based Lausanne study, it was found that smoking, hypercholesterolemia, migraine, a history of transient ischemic attack, atrial fibrillation, and heart disease were more dominant in triggering an ischemic stroke. At the same time, hypertension was the only significant factor associated with both types of stroke, namely hemorrhagic and ischemic. Thus, the presence of hypertension favouring the hemorrhagic or ischemic stroke type remains unclear<sup>[27]</sup>.

Hypertension is a well-documented risk factor for ischemic stroke and hemorrhagic stroke. However, studies show that the gradient of the association between hypertension and hemorrhagic stroke is slightly higher than that of ischemic stroke<sup>[27]</sup>. Elevated systolic blood pressure (SBP) levels were associated with increased ischemic and hemorrhagic stroke incidence, with hypertension being the highest risk. An increase in diastolic blood pressure (DBP) was also associated with an increased risk of stroke, but the risk of ischemic stroke did not show a linear relationship when the DBP level was 90 mmHg<sup>[28]</sup>.

The study of Andersen *et al.* described a higher proportion of patients with ischemic stroke who had diabetes, atrial fibrillation, myocardial infarction, and intermittent arterial claudication. Patients with hemorrhagic stroke have more severe strokes, are more likely to have a high alcohol intake, and are mostly smokers. There was no significant difference in gender, age, and prevalence of hypertension found between ischemic stroke and hemorrhagic stroke patients. However, the incidence of hypertension in hemorrhagic stroke (52.9%) was slightly higher than in ischemic stroke (51.3%)<sup>[27]</sup>.

Hypertension has been identified as the greatest risk factor for intracerebral haemorrhage. Intracerebral haemorrhage associated with hypertension usually occurs in the basal ganglia, thalamus, pons, and cerebellum; these brain areas are also susceptible to lacunar infarctions because they are vascularized by small arteries that are branches of much larger vessels. Long-term hypertension causes lipohyalinosis of small deep penetrating arteries, which results in hemispheric or deep cerebral haemorrhage. Chronic hypertension causes degenerative changes in smooth muscle cells and endothelium, leading to intracerebral haemorrhage. In addition to intracerebral haemorrhage, there is also a positive relationship between increased systolic and diastolic blood pressure and the risk of aneurysmal subarachnoid haemorrhage. The risk increases gradually with increasing blood pressure. Intracranial arterial aneurysms have historically been ascribed to congenital abnormalities that developed in vasculogenesis or angiogenesis, resulting in errors in the normal cycle of cell formation, apoptosis, and maintenance of normal extracellular matrix. It ultimately results in fatigue of the viscoelastic elements of the vessel wall and ballooning out of the affected vessel segment, with an increased tendency to rupture the vessel. Cerebral aneurysms contain only the tunica intima and adventitia and lack the muscular layer and external elastic lamina. As they enlarge and become weaker, increased blood pressure can increase the risk of rupture<sup>[29]</sup>.

## Research Method

This study used an analytic cross-sectional study design. Cross-sectional research studies the dynamics of the correlation between risk factors and effects by approaching, observing or collecting data all at once (point time approach). In cross-sectional research, known correlation (correlative) and comparative (comparative). This study uses a type of comparative research, where comparative research is research that wants to compare two or more groups of certain variables. This research will be carried out at the UKI General Hospital, East Jakarta, the teaching UKI General Hospital—starting from December 2017 – to January 2018. The target population in this study was all stroke patients who underwent inpatient services at the UKI General Hospital, East Jakarta, from January – to December 2017. The sample in this study was all stroke patients hospitalized for the first attack and had inclusion criteria and complete medical records. The sampling method used by the researcher is quota sampling. Quota sampling determines the number of sample members on a quota basis or allotment. To get a sample representing the population, the Slovin formula is used to determine the sample. So the minimum number of respondents needed as a sample in this study is "n" patients, with a ratio of the number of hemorrhagic stroke patients to non-hemorrhagic strokes is 1:1, where the number of hemorrhagic stroke patients needed as a sample is the same as the number of patients with non-hemorrhagic stroke. Data collection was carried out using secondary data obtained from the medical records of stroke patients who underwent inpatient services at the UKI General Hospital, East Jakarta, January – December 2017. stay at UKI General Hospital, East Jakarta, for January – December 2017. The instrument used in this study was a data collection form created by the researcher by adjusting the variables in the medical record data with those in the operational definition in this study. Record medical record data using the data collection form used in this study. The data is processed using a quantitative approach to conclude after being analyzed. The data is processed using SPSS for windows version 22.0. The stages of data processing to be carried out are coding, editing, data structure, data entry, and data cleaning. Data analysis was carried out univariately and analysis of different tests to determine the different risk factors possessed by stroke patients. Researchers in recruiting participant data first provide Informed Consent, namely taking care of a research permit. During and after the study, participant privacy is maintained, all participants are treated the same, participant names are replaced with numbers (anonymity), the researcher maintains the

confidentiality of the information provided and is only used for research activities and will not be published without the participant's permission.

### Result and Discussion

Research on comparing risk factors for hypertension in hemorrhagic stroke with non-hemorrhagic stroke was carried out at the UKI General Hospital, East Jakarta, from December 2017 to January 2018. From 134 patients, 127 patients were taken (consisting of 18 hemorrhagic strokes and 109 ischemic strokes patients) according to the criteria as research subjects. Furthermore, the research results in tabular form are presented in full below. The descriptive analysis that will be explained includes the frequency distribution of respondents based on age, gender, education, blood pressure, and type of stroke, shown in the following tables.

**Table 1:** Frequency distribution by the age of stroke patients undergoing inpatient services at UKI General Hospital, East Jakarta for the period January – December 2017

age	f	%
< 30	2	1,6%
30-40	2	1,6%
41-50	14	11,0%
51-60	46	36,2%
>60	63	49,6%
Total	127	100,0%

Age is one factor that plays an important role as an indicator to assess a person's health status. Increasing age can increase a person's vulnerability to disease, especially degenerative diseases. It is closely related to the decline in organ function due to ageing. The table above describes the frequency distribution of respondents by age. Based on the table above, most respondents are more than 60 years old, as many as 63 respondents (49.6%). It illustrates that the stroke pattern tends to occur in the older age group. Stroke can occur at any age, even at a young age, when viewed from the various disorders that trigger strokes, such as intracranial aneurysms, brain vascular malformations, congenital heart defects, etc. However, the pattern of stroke that tends to occur in the older age group is often found in many areas. It is caused by stroke, a disease that occurs due to the disruption of blood vessels' flow. As we know, the blood vessels of older people tend to undergo degenerative changes and begin to be seen due to the atherosclerosis process. Fast or slow the process of atherosclerosis, which can be a trigger for stroke, depends on a healthy lifestyle and eating behaviour.

**Table 2:** Frequency distribution by sex of stroke patients undergoing inpatient services at UKI General Hospital, East Jakarta for the period January – December 2017

Sex	f	%
Male	75	59,1%
female	52	40,9%
Total	127	100,0%

The table above describes the frequency distribution of respondents by gender. Based on the table above, most respondents are male, as many as 75 respondents (59.1%), while the rest are female patients as many as 52 respondents (40.9%). However, in Yanis' research (2004), it was found that there were 27 male stroke patients (40.9%) fewer than female stroke sufferers, which were 39 people (59.1%). It shows no significant difference in the proportion between male and female sufferers. In this study, it was seen that the incidence of stroke was more experienced by men than women, and this could be because women are more protected from heart disease and stroke until middle age due to the estrogen hormone they have. However, after menopause, women have the same risk as men for stroke and heart disease.

**Table 3:** Frequency distribution based on the education level of stroke patients undergoing inpatient services at UKI General Hospital, East Jakarta for the period January – December 2017

Education	f	%
Primary	22	17,3%
Senior High School	80	63,0%
Junior High School	25	19,7%
Total	127	100,0%

The table above describes the frequency distribution of respondents based on education level. Based on the table above, most respondents have high school education or more, as many as 80 respondents (63.0%). The remaining 22 respondents (17.3%) had elementary school education, and 25 respondents (19.7%) had junior high school education. It shows that the level of education as a socio-economic factor is not directly related to the incidence of stroke. However, a person's level of education determines that person's attitude towards healthy

behaviour. Stroke is a non-communicable disease that occurs due to environmental and degenerative factors, where a person's lifestyle and eating behaviour need to be considered. The Framingham Study in Massachusetts showed that the mean blood pressure in people with a high level of education was lower than the group of people with low education [30]. Therefore, someone with a higher level of education is expected to be able to understand health information and apply it in daily life.

**Table 4:** Frequency distribution based on blood pressure of stroke patients undergoing inpatient services at UKI General Hospital, East Jakarta for the period January – December 2017

Blood Pressure	f	%
Systolic < 120	18	14,2%
Systolic 120 - 139	15	11,8%
Systolic 140 - 159	37	29,1%
Systolic > 160	57	44,9%
Total	127	100,0%

Hypertension is a major risk factor for stroke, high systolic pressure and diastolic pressure. In this study, 74.02% of stroke patients had a history of hypertension (systolic > 140 mmHg), with the highest proportion being patients who had a systolic blood pressure of more than 160, which was 44.9%. It is in line with the Framingham study, which found that the incidence of stroke was higher in people with severe hypertension (blood pressure higher than 160/95 mmHg) than normotensive people (blood pressure less than 140/90 mmHg). The higher a person's blood pressure, the greater the risk for stroke. Based on the table above, it can also be seen in the results of this study that most of the stroke patients hospitalized at the UKI General Hospital had systolic blood pressure belonging to the criteria for stage 2 hypertension (systolic > 160 mmHg), as many as 57 patients (44.9 mmHg). Then followed by stage 1 hypertension (systolic 140-159 mmHg) as many as 37 patients (29.1%), pre-hypertension blood pressure group (systolic 120-139 mmHg) as many as 15 patients (11.8%) and systolic blood pressure normal (< 120 mmHg) in 18 patients (14,2%).

**Table 5:** Frequency distribution based on the degree of hypertension of stroke patients undergoing inpatient services at the UKI General Hospital, East Jakarta for the period January – December 2017

Hypertension	f	%
Degree 1	37	39,4%
Degree 2	57	60,6%
Total	94	100,0%

The table above describes the frequency distribution of respondents based on the degree of hypertension. Of the 127 inpatient stroke patients, 94 patients had hypertension, of which 37 patients (39.4%) were classified as grade 1 hypertension, and 57 patients (60.6%) were classified as grade 2 hypertension.

**Table 6:** Distribution of frequency by type of stroke in stroke patients undergoing inpatient services at UKI General Hospital, East Jakarta for the period January – December 2017

Stroke Types	f	%
Ischemic	109	85,8%
hemorrhagic	18	14,2%
Total	127	100,0%

The table above describes the frequency distribution of respondents based on the type of stroke. The proportion of stroke patients in this study shows more ischemic stroke patients than hemorrhagic stroke patients. Of the 127 inpatient stroke patients, there were 109 ischemic stroke patients (85.8%), while 18 patients (14.2%) for hemorrhagic stroke. This result is in line with various studies on other strokes. Namely, the number of patients with ischemic or non-hemorrhagic stroke is higher than that of hemorrhagic stroke—Sulastriyani's research in 2003 in the neurology inpatient IRNA B Perjan RSCM. The proportion of patients with ischemic stroke was 367 people (67%), more than hemorrhagic stroke was 185 people (33%). In Mailisafitri's study at the National Stroke Hospital (RSSN) Bukittinggi in 2010, it was found that the proportion of ischemic or non-hemorrhagic strokes was greater than that of hemorrhagic strokes. Two hundred thirty-nine people (36%) were hemorrhagic stroke patients, while 416 (64%) were non-hemorrhagic stroke patients. Ischemic stroke is more common than hemorrhagic stroke. Many disorders can support ischemic stroke, but the process of atherosclerosis is the main cause in the older adult age group. Several studies state that the most common cause of stroke is an embolism, and the second is atherosclerosis.

The following is a different test analysis to determine blood pressure differences in ischemic stroke and hemorrhagic stroke. The hypothesis is as follows:

- Ho: there is no difference in blood pressure between ischemic stroke and hemorrhagic stroke
- H1: there is a difference in blood pressure between ischemic stroke and hemorrhagic stroke

**Table 7: Mann Whitney Different Test**

Blood Pressure	Account	Sig	Conclusion
Ischemic	-2,059	0,039	Significant
hemorrhagic			

Hypertension is the most significant risk factor for stroke. Based on the study results, there were differences in the proportion of patients with hypertension in ischemic stroke patients and hemorrhagic stroke patients. For patients with ischemic stroke, 78 people out of 109 people had a history of hypertension (71.56%). Meanwhile, for hemorrhagic stroke patients, 16 out of 18 people had a history of hypertension (88.89%). The proportion of risk factors for hypertension is greater in hemorrhagic stroke patients than in ischemic stroke patients. Also supported by the table above, the calculated z value obtained in the blood pressure difference test between ischemic stroke and hemorrhagic stroke is -2.059 with a sig value of 0.039. The test criteria in this study are  $H_0$  is rejected if  $sig < 0.05$  and  $H_0$  is accepted if  $sig > 0.05$ . Because the sig value is  $0.039 < 0.05$ , it can be concluded that there are significant differences in the risk factors for hypertension in hemorrhagic and non-hemorrhagic stroke. It is not in line with the study of Andersen *et al.*, which described a higher proportion of patients with ischemic stroke who had diabetes, atrial fibrillation, myocardial infarction, and intermittent arterial claudication [30]. Although from the calculation of the sig value of this variable, there is a statistically significant difference ( $sig\ 0.039 < 0.05$ ), there is a tendency that people who have hypertension status will have the potential to experience stroke events, both ischemic and hemorrhagic.

Research conducted by Palm *et al.* found that blood pressure measurements were not statistically related to the incidence of ischemic stroke with a p-value of 0.17 [31]. These results are also supported by the research of Caso, Valeria, *et al.* which found no significant relationship between the increase in blood pressure and the incidence of ischemic stroke with an insignificant p-value [32]. However, these results contradict the study of Megherbi *et al.*, which stated that there was a significant relationship between hypertension and the incidence of ischemic stroke (p-value  $< 0.001$ ) [33]. 28% of individuals suffering from hypertension in America are not aware that they have the condition; another 39% of hypertensive patients do not receive treatment for their condition [34]. Hypertension affects 49% of stroke cases [35]. The risk of stroke in hypertensive patients is 2-3 times compared to non-patients, while the risk of pre-hypertension is about 1.5 times. An increase in blood pressure in ischemic stroke patients is associated with poor neurological conditions and outcomes, which can be death or very poor physical condition [36]. This relationship between blood pressure and stroke incidence tends to arise as a continuous effect rather than a threshold effect value. It has also been reported that strokes also occur in patients with mild hypertension.

### Conclusion

The proportion of the incidence of ischemic stroke is 85.8%, while those who have a hemorrhagic stroke are 14.2%. The distribution of patients based on socio-demographic characteristics showed that the majority of patients were  $>60$  years old (49.6%), male (59.1%), and most of the patients had high school education or more (63.0%). The proportion of risk factors for hypertension was greater in patients with hemorrhagic stroke (88.89%) than patients with ischemic stroke (71.56%). From the results of the analysis of different tests, obtained a sig value of  $0.039 < 0.05$ , it is concluded that there is a significant difference in risk factors for hypertension in hemorrhagic and non-hemorrhagic stroke. This study found a significant difference between the risk factors for hypertension in hemorrhagic stroke and non-hemorrhagic stroke, which means that the factors studied have a role in causing the stroke. Therefore, intervention programs in the form of IEC (communication, information and education) healthy lifestyles for patient health and preventing stroke in the community need to be carried out.

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