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The Analysis of Hemorrhagic Stroke and Non-Hemorrhagic Stroke Risk

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ABSTRACT

Stroke is the disease that most often causes death in Indonesia. According to Riskesdas 2007, the prevalence of stroke in Indonesia is 8.3 per 1000. This study aims to determine differences in hypertension risk factors for ischemic and hemorrhagic stroke in stroke patients at UKI General Hospital in 2017. This research was conducted by analyzing secondary data from patient medical record status using a cross-sectional study design. The results showed that there were patients with ischemic stroke (85.8%) and hemorrhagic (14.2%) with hypertension (74.02%), and characteristics of age > 60 years (49.6%), male (59.1%) %), and most of the patients had high school education or more (63.0%). Based on the different test analyses, there was a statistically significant difference between the risk factors for hypertension in hemorrhagic and non-hemorrhagic strokes.

Keywords: *Stroke, Risk Factors, Hypertension*

INTRODUCTION

The public health profile in industrialized countries has changed dramatically in the last half-century, causing Non-Communicable Diseases (NCDs) to become the leading cause of death globally. Chronic degenerative diseases such as heart disease and stroke have the highest prevalence in the general population and working people. Changes in the pattern of the structure of Indonesian society to become an industrial society have played a role in lifestyle and socio-economic changes, which can trigger an increase in non-communicable diseases. The pattern changes from communicable to non-communicable diseases is known as the epidemiological transition. From 1995 to 2007 in Indonesia, the proportion of communicable diseases decreased by a third, from 44.2% to 28.1%. However, the proportion of non-communicable diseases increased from 41.7% to 59.5%, while maternal/perinatal disorders and injury cases were relatively stable. Of the various types of non-communicable diseases that exist in developed and developing countries, heart disease and stroke occupy the top ranks as chronic diseases that cause the highest number of deaths worldwide [1]. Based on WHO data in 2012, 15 million people worldwide suffer a stroke each year [2].

Stroke is a blood vessel disorder or rupture of blood vessels in the brain so that the blood supply becomes disrupted and results in the death of brain cells because they do not get oxygen and nutrients [3]. WHO defines stroke as a clinical sign that develops rapidly due to focal (or global) brain disorders with symptoms that last for 24 hours or more and can cause death or disability without any other obvious cause other than vascular [4]. As well as being the number one cause of disability worldwide, stroke is the number two cause of dementia

and the number three cause of death after heart disease and cancer [5]. According to the World Health Organization (WHO) in 2007, it is predicted that the four main causes of global death in 2030 are ischemic heart disease, cerebrovascular disease (stroke), HIV/AIDS, and chronic obstructive pulmonary disease (COPD) [7].

Cases of stroke are quite high in developed countries like America, where obesity and fast food (junk food) have become epidemics [8]. Based on statistical data in America, it is found that 700,000 people experience a new or recurrent stroke each year [9]. It is recorded that every 45 minutes, one person in America has a stroke [8]. In 2010, America spent $73.7 million on medical coverage and stroke rehabilitation. Even so, the American Heart Association (AHA) reports that the death rate for stroke sufferers in America each year is 50-100 out of 100,000 sufferers [11]. In ASEAN countries, stroke is also a major health problem that causes death. According to WHO, the incidence of stroke in developed countries tends to decrease due to primary prevention efforts against risk factors, while in developing countries, the incidence has increased due to lifestyle changes. Approximately 5.8 million people die from stroke each year, and two-thirds of all stroke deaths occur in developing countries [10].

According to the Indonesian Stroke Foundation, in 2012, the incidence of stroke in Indonesia increased sharply [15]. The stroke problem is increasingly important and urgent because the number of stroke patients in Indonesia is the highest and ranks first in Asia [15]. From data from the South East Asian Medical Information Center (SEAMIC), it is known that the largest stroke mortality rate occurs in Indonesia, followed sequentially by the Philippines, Singapore, Brunei, Malaysia, and Thailand [14]. It is estimated that around 500,000 people in Indonesia yearly suffer a stroke. Of these, around 25%, or 125,000, died, and the rest suffered mild or severe disabilities [11].

Data from the Ministry of Health of the Republic of Indonesia (MOH RI) states that the causes of death for all ages are stroke (15.4%), tuberculosis (7.5%), and hypertension (6.8%). Based on the results of the 2007 Indonesian Basic Health Research Report (Riskesdas), related to stroke in Indonesia, which was conducted by researchers from the Indonesian Ministry of Health by taking samples from 440 districts per city (out of a total of 456 districts per city), 16 districts are not included because they are new district developments. The samples taken were spread across 33 provinces in Indonesia. The 2007 Indonesian basic health research (Riskesdas) showed that the prevalence of stroke in Indonesia was 6% or 8.3 per 1000 population diagnosed by health personnel was 6 per 1000. It shows that health workers have diagnosed around 72.3% of stroke cases in the community [16]. According to Basic Health Research (RISKESDAS) in 2013, the prevalence of stroke in Indonesia is based on the answers of respondents who had been diagnosed by health workers and had symptoms of 12.1 per mil. The prevalence of stroke based on diagnosis by health workers was highest in North Sulawesi (10.8‰), followed by DI Yogyakarta (10.3‰), Bangka Belitung, and DKI Jakarta, each with 9.7 per mile [19]. The number of people who have had a stroke in Indonesia is increasing yearly. This increase does affect not only the elderly but also young people of productive age. By 2020 an estimated 7.6 million people will die from a stroke. The highest increase will occur in developing countries, especially in the Asia Pacific region [8].. With this data, the government, such as the health department, should be able to make policies 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. According to Davenport and Dennis, stroke can be broadly divided into two parts: non-hemorrhagic and hemorrhagic. In western

countries, of all recorded stroke sufferers, 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 disrupting the need for blood and oxygen in the brain [20]. Of all stroke patients in Indonesia, non-hemorrhagic stroke is the most common type, namely 52.9%, followed sequentially by intracerebral hemorrhage, embolism, and subarachnoid hemorrhage with an incidence rate of 38.5% each, 7.2%, and 1.4% [11].

Stroke risk factors are divided into unmodifiable risk factors and modifiable risk factors. The National Stroke Association (NSA) classifies age, sex, race, sodium, high cholesterol levels, diabetes, atherosclerosis, smoking, alcohol consumption, and obesity [11]. Risk factors that trigger a high rate of non-hemorrhagic stroke are non-modifiable risk factors such as age, race, gender, genetics, and a history of a previous transient ischemic attack or stroke. Meanwhile, modifiable risk factors include hypertension, heart disease, diabetes, hypercholesterolemia, smoking, obesity, oral contraceptives, and alcohol. Hypertension is a problem often found in stroke patients and persists after a stroke.

In Indonesia, stroke patients' ages generally range from 45 years and over. The modern and instant lifestyle now 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 who have some disability. The percentage of stroke patients are aged 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% [11]. Prevention efforts are one of the most effective and efficient ways to reduce the incidence of stroke [21]. If we know what risk factors can cause a stroke, new prevention efforts can be made. Therefore, knowledge of the risk factors that cause stroke is needed to formulate an effective prevention method. The world stroke organization notes that almost 85% of people who have risk factors can avoid stroke if they are aware of and treat these risk factors early. The World Health Organization predicts that deaths from stroke will increase along with deaths from heart disease and cancer by approximately six million in 2010 to eight million in 2030 [13].

Thus, identifying stroke risk factors is very important to control the incidence of stroke in a country. Because of that, the authors are interested in researching the comparison of risk factors for hypertension in hemorrhagic and non-hemorrhagic strokes at UKI General Hospital. It is hoped that the results of this study will be useful for formulating stroke prevention and management programs in the future because, based on identifying these risk factors, stroke prevention and management 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 and non-hemorrhagic strokes? The aim is to determine whether there are differences in the risk factors for hypertension in hemorrhagic and non-hemorrhagic strokes at the Indonesian Christian University Hospital.

LITERATURE REVIEW

WHO defines stroke as a focal or global central nervous system disorder that occurs suddenly, lasts more than 24 hours, or causes death without any other cause other than vascular disorders [22]. Stroke is a term used to describe a neurological change caused by an interruption of the blood supply to a part of the brain. Junaidi also defines stroke in Nastiti as an acute focal and global brain functional disorder with symptoms and signs according to the part of the brain affected, which was previously without warning, and can recover completely, recover with a disability, or death caused by interruption of blood flow to the brain due to bleeding or non-bleeding [21]. There are two main classifications of

stroke, namely ischemic stroke or non-hemorrhagic and hemorrhagic stroke, based on the cause and pathophysiological findings [11]. Davis et al. differentiate stroke based on its cause into ischemic stroke (80%), hemorrhagic stroke or intracerebral hemorrhage (15%), and subarachnoid hemorrhage (5%) [24].

Based on the World Stroke Organization (WSO), 1 in 6 people suffers a stroke, and almost every 6 seconds, someone dies from a stroke, which means that every year nearly 6 million people worldwide die from a stroke [11]. In western countries, about 80% of stroke is caused by focal cerebral ischemia due to arterial occlusion, and 20% is caused by bleeding [6]. The prevalence of stroke in Indonesia, according to the 2013 Riskesdas, based on the diagnosis of health workers or symptoms, is 12.1 per mile [17]. Health workers have diagnosed as many as 57.9% of strokes. The prevalence of stroke seems to increase with the increasing age of the respondent, the highest is at the age of ≥75 years (43.1‰ and 67.0‰), and the same is true for men and women [18]. Stroke risk factors can be categorized into modifiable and non-modifiable risk factors [23]. Modifiable risk factors include hypertension, cholesterol, hyperglycemia, diabetes mellitus, obesity, heart disease, smoking, and blood clotting disorders [28]. At the same time, the factors that cannot be modified are age, gender, race, and family history [29].

Interruption of the 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 its branches. In general, tissue infarction will occur if blood flow to the brain is stopped for 15 to 20 minutes. The underlying pathological process can be: [26]. a) conditions in the blood vessels themselves, such as atherosclerosis and thrombosis, tearing of the blood vessel walls, or inflammation; b) reduced perfusion due to impaired blood flow status, e.g., blood hyperviscosity shock; c) impaired blood flow due to a clot or embolus of infection originating from the heart or extracranial vessels; and d) vascular rupture within the brain parenchyma or subarachnoid.

According to Black & Hawk (2009), the clinical manifestations of clients affected by a stroke vary depending on the cause, the area of the damaged neurons, the location of the neurons affected, and the condition of the cerebral collateral vessels. Manifestations of ischemic stroke include transient hemiparesis, loss of speech function, and hemisensory loss. The process of cerebral blood vessel blockage has several specific clinical features: [11]. a) It appears suddenly. The onset of symptoms is sudden and is rarely preceded by warning signs such as headaches, nausea, vomiting, and so on; b) Demonstrate neurological symptoms contralateral to the occluded vessel. It is especially evident in cerebrovascular disease of the carotid system; c) Decreased consciousness to coma is rare, except for cerebral hemorrhage.

In addition, cerebral artery occlusion can cause several symptoms, including contralateral hemiparesis (motor disturbance), hemianesthesia (sensory disturbance), hemianopsia (impairment in half of the visual field), aphasia or dysphasia, spatial perception abnormalities, apraxia, apathy, even coma [31]. Patients with ischemic embolic stroke and hemorrhagic stroke generally show a more severe clinical picture than thrombotic stroke because embolic stroke usually causes sudden neurological deficits with maximum effect since the onset of the disease. In contrast, a hemorrhagic stroke can quickly cause neurologic symptoms due to pressure on the nerve structures within the skull and quickly cause brain function impairment and loss of consciousness, [27]. even death which is rapid compared with the gradual course of ischemic stroke. In most cases of ischemic stroke, clear information can be obtained regarding the location of the lesion in any part of the brain. However, in hemorrhagic strokes, various complications of brain hemorrhage

often occur, which cause disturbances in brain function that also occur in areas other than the area where the bleeding occurs. It is caused by increased intracranial pressure, brain edema, brain tissue, blood vessel compression, and the dispersion of blood coming out in various directions. Therefore, localized focal symptoms usually occur in ischemic stroke, whereas in hemorrhagic stroke, the focal symptoms are less obvious and less predictive of a specific localization [21].

It follows the results of a study by Tino Rani, who stated that there are differences in activities of daily living between hemorrhagic and non-hemorrhagic post-stroke patients, where post-stroke patients with hemorrhagic type have worse scores than post-stroke patients with non-hemorrhagic types. The impact that arises from a stroke includes physical and psychological disturbances [34]. One of the physical effects of a stroke is disability/limitation, with the disability most often referred to as inpatient rehabilitation being the inability to walk safely without physical assistance. About 65% of patients cannot do activities with both hands six months after the stroke as usual [35]. Fathurrohman's research in 2011 found muscle strength in the extremities of stroke patients; the average was in the hands and feet. It indicates decreased muscle strength in stroke patients, resulting in hemiparesis or paralysis [30]. While the psychological disorders that arise are mental changes, emotional disturbances, and depression.

The likelihood of improvement after stroke varies according to the nature and severity of the initial deficit. Approximately 35% of stroke survivors experience paralysis of the limbs that cannot function again, and 20-25% of all sufferers can walk without physical assistance. About 20% of patients have impaired speech expression and comprehension after stroke and should receive speech therapy. Only 25% of patients return to the same level of ability of daily activities and physical function as non-stroke patients [35].

Recurrent stroke was defined as a new neurologic deficit consistent with the definition of ischemic/hemorrhagic stroke that occurs after a defined period of neurological stability, lasts more than 24 hours, and is not attributable to edema, mass, shift brain syndrome, or hemorrhagic transformation [36]. Based on the World Health Organization, to be defined as a recurrent stroke, new stroke symptoms that occur must meet one of the following criteria: [37]. a) If the event occurs in the same arterial distribution area, the time interval with the previous stroke occur must be $\geq$ 29 days. And b) If the event occurs in a markedly different area of arterial distribution, the time interval to the previous stroke may be $\leq$ 28 days.

Recurrent strokes often have higher rates of death and disability because the part of the brain that was damaged by a stroke in the first attack will be damaged again, and in repeated strokes, there will be more extensive bleeding in the brain so that the condition can be more severe than the first attack. Research shows that, among people who have had a stroke, about 40% will have another stroke within five years [46]. Ischemic stroke patients are more at risk for recurrent stroke than hemorrhagic stroke patients. Leoo et al. reported of 889 recurrent stroke patients with an average age of 77 years, 805 patients (91%) of them were ischemic strokes, 78 patients (9%) were intracerebral hemorrhagic strokes and 6 of them (1%) with unknown cause. Most risk factors are hypertension (75%) and hyperlipidemia (56%) [38]. Ischemic stroke or "brain attack" is a sudden loss of function due to interruption of the blood supply to parts of the brain due to either partial or total blockage of an artery. This type of stroke accounts for nearly 80% of strokes [11]. Ischemic stroke is defined as loss of neurologic function resulting from sudden cessation of cerebral circulation. Ischemic stroke is also an episodic neurological disorder resulting from a focal cerebral, spinal, or retinal infarction [22].

Thrombotic strokes can be divided into strokes of the large vessels (including the carotid artery system) and small vessels (including the circle of Willis and the posterior circle) [39]. The most common site of thrombosis is the branching points of the cerebral arteries, especially in the distribution area of the internal carotid artery. Complete cessation of cerebral blood flow causes loss of consciousness within 15-20 seconds and irreversible brain damage after 7-10 minutes [32]. When the blood flow to brain tissue stops, the oxygen and glucose required for the formation of ATP will decrease, and there will be a decrease in the Na+ K+ ATP-ase pump so that the membrane potential will decrease [39]. This decrease in the Na+ K+ ATP-ase pump leads to the accumulation of cell Na+ and Ca2+ and an increase in extracellular K+ concentration. It causes the cell surface to become more negative, resulting in membrane depolarization. It causes cellular Cl accumulation, cell swelling, and cell death. It also triggers the release of glutathione-tamate, which accelerates cell death through the influx of Na+ and Ca2+ [33]. Initially, the depolarization of the cell membrane is reversible, but if it persists, structural changes occur that cause brain tissue death. It occurs immediately when perfusion falls below the threshold for tissue death, i.e., when blood flow is reduced to below 10 ml/10 g/min. Due to the lack of oxygen, acidosis occurs, which disrupts the function of enzymes due to high H ions. Furthermore, acidosis causes cerebral edema, marked by swelling of cells, especially glial tissue, and affects microcirculation [40]. Therefore there is an increase in vascular resistance and then a decrease in perfusion pressure so that if this is not corrected, an ischemic expansion occurs, which can cause cell death.

Hemorrhagic stroke occurs when an intracerebral vascular lesion ruptures, resulting in bleeding into the subarachnoid space or directly into the brain tissue [25]. Intracerebral hemorrhage most commonly 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 (amyloid angiopathy) weakens the arteries and can cause bleeding [41]. Less common causes include birth defects, wounds, tumors, inflammation of the blood vessels (vasculitis), bleeding disorders, and overdosage of anticoagulants. Bleeding disorders and the use of anticoagulants increase the risk of death from intracerebral hemorrhage [41].

Several common risk factors can occur in hemorrhagic stroke and ischemic stroke. Atrial fibrillation, ischemic heart disease, and diabetes with ischemic stroke appear to be well-established in comparative studies, but the relative role of risk factors such as hypertension, smoking, and alcohol consumption remains controversial [43]. Elevated blood pressure (BP) is a risk factor for cardiovascular disease, but it is unclear whether systolic BP (SBP), diastolic BP (DBP), pulse pressure (PP), or mean arterial pressure (MAP) are most useful in predicting stroke events. In addition, the risk associated with blood pressure measures may be different for the two main stroke types, ischemic and hemorrhagic.

Knowledge of the relative role of risk factors in hemorrhagic versus ischemic stroke is inconsistent. In a population-based study conducted by Perth, hypertension and diabetes were more likely to precipitate ischemic strokes, and high alcohol intake was more likely to cause hemorrhagic strokes, whereas smoking did not support a difference in the two types of stroke. Another population-based observational study showed that increasing age, prior stroke, and diabetes are more common causes of ischemic stroke, whereas ischemic heart disease, atrial fibrillation, hypertension, alcohol intake, and smoking are independent of either stroke type. Based on the hospital-based Lausanne study, it was found that the risk factors for smoking,

hypercholesterolemia, migraine, 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 existence of hypertension that supports the type of hemorrhagic or ischemic stroke is still unclear [43].

Hypertension is a well-documented risk factor for ischemic and hemorrhagic strokes. However, studies also show that the gradient of the relationship between hypertension and hemorrhagic stroke is slightly higher than ischemic stroke [43]. An increase in systolic blood pressure (SBP) level is associated with an increased incidence of ischemic and hemorrhagic stroke, with hypertension having the highest risk. Increased diastolic blood pressure (DBP) is also associated with an increased risk of stroke, but the risk of ischemic stroke does not show a linear relationship when the DBP level is 90 mmHg [42].

Andersen et al.'s study described a higher proportion of ischemic stroke patients with diabetes, atrial fibrillation, myocardial infarction, and intermittent arterial claudication. Patients with hemorrhagic strokes have more severe strokes, are more frequent due to high alcohol intake, and are mostly smokers. There were no significant differences 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 that of ischemic stroke (51.3%) [43].

Hypertension has been identified as the greatest risk factor for intracerebral hemorrhage. Intracerebral hemorrhage associated with hypertension usually occurs in the basal ganglia, thalamus, pons, and cerebellum; These brain areas are also susceptible to lacunar infarction because small arteries supply them are branches of much larger vessels. Long-term hypertension causes lipohyalinosis of the small deep penetrating arteries, resulting in a hemispheric or a deep cerebral hemorrhage. Chronic hypertension causes degenerative changes in smooth muscle cells and endothelium, predisposing to intracerebral hemorrhage. In addition to intracerebral hemorrhage, a positive relationship exists between increased systolic and diastolic blood pressure and the risk of aneurysmal subarachnoid bleeding. The risk increases gradually with increasing blood pressure. Intracranial artery aneurysms have historically been ascribed to congenital abnormalities that develop in vasculogenesis or angiogenesis, resulting in errors in the normal cycle of cell formation, apoptosis, and maintenance of a normal extracellular matrix. It ultimately leads to fatigue of the viscoelastic elements of the vessel wall and the outer balloon of the affected vessel segment, with an increased tendency to rupture the vessel. Cerebral aneurysms contain only the tunica intima and adventitia and are devoid of a muscular layer and an external elastic lamina. As they enlarge and become weaker, increased blood pressure can increase the risk of rupture [44].

RESEARCH METHOD

This study uses a cross-sectional study design that is analytic in nature. Cross-sectional research studies the dynamics of the correlation between risk factors and effects by way of approach, observation, or data collection at one time (point time approach) [45]. In cross-sectional studies, known correlation (correlative) and comparative (comparative) research. This study uses a type of comparative research, where comparative research is research that wants to compare two or more groups about certain variables [46]. This research will be carried out at UKI General Hospital, East Jakarta, a teaching hospital at the Indonesian Christian University. This research will be conducted from December 2017 - January 2018. The target population in this study were all stroke patients undergoing inpatient services at UKI

General Hospital for the period January - December 2017. The sample in this study were all stroke survivors hospitalized for the first attack who had inclusion criteria and had complete medical record records at UKI General Hospital East Jakarta for the period January - December 2017. The sampling method used by researchers is quota sampling. Quota sampling is done by determining the number of sample members by quota or quota. This sampling technique is carried out by first determining the number of samples required or setting a quota (quota). Then the amount (quotum) is used as the basis for taking the required sample unit [45]. The Slovin formula was used to determine the sample to obtain a representative population sample. So the minimum number of respondents required as a sample in this study is "n" patients, with a ratio of the number of hemorrhagic to non-hemorrhagic stroke patients is 1:1, where the number of hemorrhagic stroke patients required as a sample is the same as the number of patients with non-hemorrhagic stroke. Data collection was carried out using secondary data from the medical records of stroke patients undergoing inpatient services at UKI General Hospital East Jakarta for January - December 2017. This study collected secondary data from the medical records of patients diagnosed with stroke in the inpatient room at UKI General Hospital, East Jakarta, for the period January - December 2017. The instrument used in this study was a data collection form created by researchers by adjusting the variables in the medical record data with those in the operational definitions 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 stages of data processing that will be carried out are coding, editing, data structure, data entry, and data cleaning. Data analysis was carried out univariately, and different test analyses were to determine the differences in risk factors possessed by stroke patients at UKI General Hospital East Jakarta for the period January - December 2017. The variables used in this study are all categorical, so the results will be presented in proportions. The presentation of results is supported with the help of tables and diagrams to make it easier to read the results.

RESULT AND DISCUSSION

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

Table 1. Frequency distribution based on the age of stroke patients undergoing inpatient services

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 a factor that plays an important role as an indicator to assess a person's health status. Age can potentially increase a person's susceptibility to suffering from diseases, especially degenerative diseases. It is closely related to decreased organ function due to aging. The table above illustrates the distribution of the frequency of respondents based on age. Based on the table above, most respondents are over 60 years old, namely 63 respondents (49.6%). It illustrates that the stroke pattern tends to occur in the older age group. Strokes 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, and others. However, the pattern of stroke that tends to occur in the older age group is often found in many areas. A stroke causes a disease due to impaired blood vessel flow. As we know, the blood vessels of older people tend to experience degenerative changes and begin to show the results of the atherosclerotic process. Sooner or later, atherosclerosis, which can trigger a stroke, depends on a healthy lifestyle and eating behavior.

Table 2. Frequency distribution based on the sex of stroke patients undergoing inpatient services

Gender	f	%
Male	75	59,1%
Female	52	40,9%
Total	127	100,0%

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

Table 3. Frequency distribution based on the educational level of stroke patients undergoing inpatient services

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

The table above illustrates the frequency distribution of respondents based on education level. Based on the table above, most respondents had a high school education or more, namely 80 respondents (63.0%). The remaining 22 respondents (17.3%) had elementary school education, and 25 (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 toward healthy behavior. Stroke is a non-communicable disease that occurs due to environmental and degenerative factors, where a person's lifestyle and eating behavior need to be considered. The Framingham Study in Massachusetts showed that the average blood pressure in a group of people with a high level of education was lower than that of a group of people with low education. Therefore, someone with a higher level of education is expected to be able to understand health information and apply it in everyday life.

Table 4. Frequency distribution based on blood pressure of stroke patients undergoing inpatient services

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, both systolic and high diastolic pressure. In this study, 74.02% of stroke patients had a history of hypertension (systolic > 140 mmHg), with the highest proportion being patients with 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 in normotensive people (blood pressure less than 140/90 mmHg). The higher a person's blood pressure, the greater the stroke risk. Based on the table above, it can also be seen in the results of this study that the majority of inpatient stroke patients at the Indonesian Christian University Hospital had systolic blood pressure belonging to the criteria for stage 2 hypertension (systolic >160 mmHg),

namely 57 patients (44.9 %). Then followed by the stage 1 hypertension group (systolic 140-159 mmHg) totaling 37 patients (29.1%), pre-hypertension blood pressure group (systolic 120-139 mmHg) totaling 15 patients (11.8%), and systolic blood pressure normal (<120 mmHg) in 18 patients (14.2%).

Table 5. Distribution of frequency based on the degree of hypertension of stroke patients undergoing inpatient services

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

The table above illustrates 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 based on the type of stroke in stroke patients undergoing inpatient services

Stroke Type	f	%
Ischemic	109	85,8%
Hemorrhagic	18	14,2%
Total	127	100,0%

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

In the following, a different test analysis was conducted to determine the difference in blood pressure in ischemic and hemorrhagic strokes. 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 Difference Test

Blood pressure	z-count	Sig	Conclusion
ischemic	-2,059	0,039	Significant
Hemorrhagic			

Hypertension is the most significant risk factor for stroke. The results of the study showed a difference in the proportion of patients with hypertension in ischemic stroke patients and hemorrhagic stroke patients. For ischemic stroke patients, 78 out of 109 had a history of hypertension (71.56%). Meanwhile, for hemorrhagic stroke patients, 16 out of 18 people had a history of hypertension (88.89%). It shows that 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 and hemorrhagic stroke is -2.059, with a sig value of 0.039. The test criteria in this study were that Ho was rejected if sig < 0.05 and Ho was accepted if sig > 0.05. Because the sig value was 0.039 <0.05, it was concluded that there were significant differences in the risk factors for hypertension in hemorrhagic

and non-hemorrhagic strokes. It is not in line with the study of Andersen et al., which described a higher proportion of patients with ischemic stroke who suffer from diabetes, atrial fibrillation, myocardial infarction, and intermittent arterial claudication. 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 with hypertension status will have the potential to experience strokes, both ischemic and hemorrhagic types.

Research conducted by Palm et al. (2011) found results of blood pressure measurements that were not statistically related to the incidence of ischemic stroke with a p-value of 0.17. These results were also supported by the research of Caso, Valeria, et al. (2010), which also found no significant relationship between increased blood pressure and the incidence of ischemic stroke with an insignificant p-value. However, these results contradict the study of Megherbi et al. (2002), which stated that there was a significant relationship between hypertension and the incidence of ischemic stroke (p-value <0.001). Alexander (2011) stated that 28% of individuals who suffer from hypertension in America are unaware that they have this condition, and 39% of other hypertensive sufferers do not receive treatment. Basjirrudin (2012) found that hypertension affects 49% of stroke cases. The risk of stroke in hypertensive patients is 2-3 times compared to non-sufferers, while the risk of pre-hypertension is around 1.5 times. Heitsch (2007) states that increased blood pressure in ischemic stroke patients is associated with poor neurological conditions and outcomes, such as death or weakness in very bad physical conditions. The relationship between blood pressure and stroke incidence tends to arise as a continuous effect rather than a threshold effect value. It has also been widely reported that stroke occurs in patients with mild hypertension.

CONCLUSION

The proportion of ischemic strokes was 85.8%, while those who experienced hemorrhagic strokes were 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 is greater in hemorrhagic stroke patients (88.89%) than in ischemic stroke patients (71.56%). From the results of the different test analyses, a sig value of 0.039 <0.05 was obtained, and it was concluded that there were significant differences in the risk factors for hypertension in hemorrhagic and non-hemorrhagic strokes. 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 a stroke. Therefore, intervention programs for patient health and preventing stroke events in the community must be carried out. Risk factors such as hypertension are still the most common problem in stroke patients. Therefore it is necessary to have an intervention program in the form of IEC (communication, information, and education) healthy lifestyle to improve health conditions and to slow the progression of stroke. Health education related to risk factors and stroke prevention can also be carried out in the community to prevent the increase in the incidence of stroke.

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