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THE CORRELATION BETWEEN HYPERTENSION AND STROKE INCIDENCE AT UKI GENERAL HOSPITAL IN 2017

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ABSTRACT

This study aims to determine the relationship between hypertension and the incidence of stroke in UKI General Hospital in 2017. This research uses a retrospective correlational analytic study using secondary data, medical records between January - December 2017, and the sample was stroke patients with hypertension at UKI General Hospital between January – December 2017. The study results indicate a significant relationship between hypertension and the incidence of stroke, from a clinical per cent of view based on the frequency of hypertension and stroke among the patients.

KEYWORDS: *Hypertension, stroke, the risk factor.*

INTRODUCTION

Hypertension is often referred to as the "silent killer" and is the most common disease found in medicine. Hypertension increases the systolic blood pressure of more than 140 mmHg or diastolic more than 90 mmHg.[1,2] World Health Organization (WHO) also reports that one billion people worldwide suffer from hypertension. 2/3 of them are in developing countries with low to moderate income. The national hypertension prevalence based on Riskesdas 2013 was 25.8%, the highest was in the Bangka Belitung Islands (30.9%), while the lowest was in Papua (16.8%). Based on these data, out of 25.8% of people with hypertension, only 1/3 were diagnosed, the remaining 2/3 were undiagnosed. Data shows that only 0.7% of people diagnosed with high blood pressure take hypertension medication. It shows that most people with hypertension are not aware of having hypertension or getting treatment.[3]

The hypertension prevalence will continue to increase sharply, and it is predicted that by 2025 as many as 29% of adults worldwide are affected by hypertension. Hypertension has resulted in the death of about 8 million people every year, of which 1.5 million deaths occur in Southeast Asia, where 1/3 of the population suffers from hypertension, causing an increase in the burden of health costs. According to the 2014 Indonesian Sample Registration System (SRS) data, hypertension with complications is the 5th leading cause of death at all ages. The most common complication of hypertension is stroke, reaching 51% compared to coronary heart disease.[3]

Stroke, also known as Brain Circulatory Disorder, is a syndrome caused by disruption of blood flow in one part of the brain that causes functional brain disorders in the form of neurological deficits or nerve paralysis.[4] Stroke is the number one cause of disability and the third leading cause of death globally after heart disease and cancer, both in developed and developing countries.[5] The national stroke prevalence based on Riskesdas 2013 was 12.1%, the highest was in South Sulawesi (17.9%), and the lowest was in Riau (5.2%). The Indonesian Sample Registration System (SRS) in 2014 showed that stroke was the leading cause of death, amounting to 21.1% of all causes of death for all age groups. Stroke also has a significant impact on society from a socio-economic perspective because of the relatively high cost of treatment and the resulting disability. Data from the Social Security Administering Agency in 2015 stated that stroke cost health care costs Rp. 1.15 trillion and increased to Rp. 1.27 trillion in 2016. It means an increase in financing of 10.4% for stroke in the period 1year time.

Thus, it is clear that stroke is a severe health problem, and the incidence has not been significantly reduced. Given that hypertension is the leading risk factor for both ischemic stroke and hemorrhagic stroke, this study attempts to better know and recognize hypertension by studying the relationship between hypertension and the incidence of stroke at UKI General Hospital in 2017.

LITERATURE REVIEW

Hypertension increases blood pressure above normal which results in the supply of oxygen and nutrients carried by the blood being blocked to the body's tissues.[6] Blood pressure is the pressure exerted by the blood against the resistance of the walls of blood vessels. Blood pressure is affected by cardiac output and peripheral resistance. The cardiac output itself is heart rate per minute and stroke volume. The magnitude of the stroke volume is determined by the strength of myocardial contraction and venous return, while peripheral resistance is the resistance to blood flow through a blood vessel due to friction of moving fluid and stationary vessel walls. The variance of blood flow in narrow blood vessels due to prolonged hypertension will trigger an inflammatory response and the entry of LDL (low-density lipoprotein) into the endothelium. Macrophages will phagocytize incoming LDL to form foam cells, later becoming fatty streaks and eventually forming atherosclerotic plaques in blood vessels. The plaque will thicken and inhibit the exchange of oxygen in the arterial walls, resulting in degeneration and damage, leading to the growth of excessive fibrous connective tissue known as atherosclerosis. Atherosclerosis can affect arteries throughout the body, but the most severe consequences affect the blood vessels in the brain because it causes a stroke.[7]

Based on the cause, hypertension is divided into two groups, namely primary (essential) hypertension and secondary hypertension.[8] According to the eighth report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure (JNC VIII), the classification of high blood pressure in adults is divided into standard, pre-hypertensive, grade 1 hypertension, grade 2 hypertension.

Table 1: Classification of blood pressure according to JNC VIII.[9]

Classification	systolic (mmHg)		Diastolic (mmHg)
Normal	<120	and	< 80
Prehypertension	120-139	or	80-90
Hypertension grade 1	140-159	or	90-99
Hypertension grade 2	≥ 160	or	≥ 100

WHO and the International Society of Hypertension Working Group (ISHWG) have classified hypertension into optimal, normal, normal-high, mild hypertension, moderate hypertension, and severe hypertension and isolated hypertension.

Table 2: Classification of Blood Pressure According to WHO.[10]

Classification	systolic (mmHg)	Diastolic (mmHg)
Optimal Normal Normal height	< 120 120-129 130-139	< 80 80-84 85-89
Grade 1 hypertension (mild)	140-159	90-99
Grade 2 hypertension (moderate)	160-179	100-109
Grade 3 hypertension (severe)	≥ 180	≥ 110
Isolated systolic hypertension	≥ 140	< 90

Hypertension is a multifactorial disease. Various mechanisms play a role in increasing blood pressure. The mechanism of hypertension is through the formation of angiotensin II from angiotensin I by angiotensin-converting enzyme (ACE). Angiotensinogen, a globulin secreted in the liver, is a substrate for renin. Renin is an enzyme produced in the juxtaglomerular cells and works to change the concentration of Na+ and Cl- in the renal tubules during conditions of decreased blood pressure, dehydration, and blood loss. Renin acts on angiotensinogen to produce angiotensin I. Then, angiotensin I is assisted by the angiotensin-converting enzyme (ACE), which is found in the lungs, endothelial cells and plasma to produce angiotensin II. Angiotensin II increases blood pressure by vasoconstriction of arterioles and stimulates aldosterone secretion resulting in sodium retention and blood pressure.[11]

Stroke is a disease due to circulatory disorders of the brain influenced by many risk factors, and some cannot be changed, such as age and gender. Some can be changed, such as hypertension, increased blood sugar levels, dyslipidemia, and occupation.4 Stroke can also be defined as a disorder. Acute, focal, or global brain function due to disruption of blood flow to the brain due to bleeding or blockage with symptoms and signs corresponding to the part of the brain affected and can recover completely, heal with a disability, or end in death.[12]

Stroke has a close relationship with hypertension can be seen from the increase in systolic and diastolic blood pressure. A person is said to have a stroke if he has been diagnosed with a stroke by a health worker or has never been diagnosed but has experienced sudden paralysis on one side of the body accompanied by tingling (numbness), a slanted mouth, difficulty speaking (speechless).[13]

Stroke can be divided into two parts, namely ischemic stroke and hemorrhagic stroke. Ischemic stroke is an ischemic stroke that occurs due to a lack of blood flow to the brain, a decrease in blood flow that gets worse and can cause brain tissue death, which is called a brain infarction. Under normal circumstances, blood flow to the brain is 58 ml/100 g brain tissue/min. If this drops to

18 ml/100 g of brain tissue every minute, the electrical activity of the neurons stops, but the cell structure is still good, so the clinical symptoms are still reversible. Thus, brain infarction occurs due to prolonged and severe brain ischemia with irreversible brain function and structure changes.[14] Ischemic stroke can be divided into two based on clinical manifestations (TIA - Transient Ischemic Attack, RIND - Reversible Ischemic Neurological Deficit, Stroke in evolution, and Stroke in development). Complete Stroke) and based on the cause (thrombotic stroke, embolic stroke, lacunar stroke. Hemorrhagic stroke can be divided into 2, namely intracerebral haemorrhage and subarachnoid haemorrhage.

Stroke is a disease with many risk factors or multicausal. Risk factors associated with stroke are divided into 2, namely, non-modifiable risk factors and modifiable risk factors. The risk factors that cannot be modified are age, gender, family history of disease and race.[15] Modifiable risk factors are risk factors that can be prevented from developing a disease, consisting of obesity, hyperlipidemia, blood sugar levels, smoking, and hypertension.[16] Large strokes are related to hypertension because high blood pressure can trigger injury to the endothelium of blood vessels so that monocytes and LDL enter the blood vessel walls and stimulate smooth muscle cells and fibroblasts, resulting in the formation of fibrous plaques. The plaque will get bigger and become a thrombus, and the thrombus can be released following the bloodstream, known as an embolus (ischemic stroke). Thrombus often occurs in the internal carotid and basilar arteries, but the neurologic deficit is reversible, whereas emboli are common in the aortic arch and middle cerebral artery.[21] As a result of damage to the endothelium of blood vessels in the brain, the walls of the blood vessels become weak, accompanied by high blood pressure, which can cause brain blood vessels to rupture, resulting in hemorrhagic stroke.

Research Method

This research is a retrospective correlational analytic study using secondary data from medical records. The location of this research is at UKI General Hospital, East Jakarta. Permission for the collection of medical record data was obtained from the Director of the UKI General Hospital (Appendix 4) at the request of the Dean of the Medical Faculty and was carried out in August – September 2018. The research subjects were 131 patients who suffered a stroke at UKI General Hospital Jakarta in 2017. The sample used in this study were patients who met the inclusion criteria. Researchers used non-probability methods with the purposive sampling technique.

Secondary data collection was carried out by collecting medical records of stroke patients at UKI General Hospital, Jakarta, from January 1, 2017, to December 31, 2017. Patient data included name, age, gender, diagnosis, laboratory results and data on the patient's blood pressure when the stroke was first diagnosed and the patient's blood pressure on discharge from the hospital. The instrument used in this study was a data entry form (Data Collection Form) regarding the identity and other required data from the medical records of stroke patients at UKI General Hospital Jakarta in 2017. Data processing is interpreting the existing data according to the research's purpose, design, and nature. The steps that must be done in data processing are editing, coding, processing, and cleaning—the data analysis used in univariate data analysis and bivariate analysis. The univariate analysis aims to describe the frequency distribution. Bivariate analysis was used to test the relationship between two variables using Chi-Square analysis.

RESULT AND DISCUSSION

The table below shows that 63 patients (48.1%) aged less than 60 years and 68 patients (51.9%) aged more than 60 years.

Table 3: Distribution of Patient Frequency by Age.

		Frequency	%
Valid	<60	63	48.1
	≥60	68	51.9
	Total	131	100.0

The following table shows 77 male patients (58.8%) and 54 female patients (41.2%).

Table 4: Distribution of Patient Frequency by Gender.

		Frequency	%
Valid	Male	77	58.8
	Female	54	41.2
	Total	131	100.0

The table below shows that the normal blood pressure of patients when they entered the UKI General Hospital was three people (2.3%), there were 21 people with prehypertension (16%), 34 people with grade 1 hypertension (26%) and two there are as many as 73 people (55.7%).

Table 5: Distribution of Patient Frequency Based on Patient's Blood Pressure on Admission to UKI General Hospital.

		Frequency	%
Valid	Normal	3	2.3
	Prehypertension	21	16.0
	Hypertension grade 1	34	26.0
	Hypertension grade 2	73	55.7

The following table shows that the patient's blood pressure when they left the UKI General Hospital were normal as many as 28 people (21.4%), prehypertension as many as 56 people (42.7%), hypertension grade 1 as many as 35 people (26.7%) and hypertension degree 2 as many as 12 people (9.2%). This study uses blood pressure parameters based on JNC VIII.

Table 6: Distribution of Patient Frequency Based on Patient's Blood Pressure when Out of UKI General Hospital.

		Frequency	%
Valid	Normal	28	21.4
	Prehypertension	56	42.7
	Hypertension grade 1	35	26.7
	Hypertension grade 2	12	9.2
	Total	131	100.0

The table below shows that there were 109 patients with non-hemorrhagic stroke (NHS) (83.2%) and 22 patients with hemorrhagic stroke (HS) (16.8%).

Table 7: Distribution of Patient Frequency by Type of Stroke.

		Frequency	%
Valid	NHS	109	83.2
	HS	22	16.8
	Total	131	100.0

The table below shows that one person (0.8%) had an LDL test result of less than 100 mg/dL while more than 100 mg/dL was 86 people (65.6%). The table above also shows that 45 people (34.4%) did not do LDL checks.

Table 8: Distribution of Patient Frequency Based on LDL (Low-Density Lipoprotein) Examination Results.

		Frequency	%
Valid	<100	1	0.8
	≥100	85	64.9
	Total	86	65.6
Less Data	System	45	34.4
Total		131	100

The following table shows that one person (0.8%) had a TBS test result of less than 200 mg/dL while 113 people (86.3%) had a GDS test result of more than 200 mg/dL. The table above also shows that as many as 17 people (13%) did not do the GDS examination. (Appendix 1 No.7)

Table 9: Distribution of Patient Frequency Based on TBS Examination Results (Time Blood Sugar).

		Frequency	%
Valid	<200	1	0.8
	≥200	113	86.3
	Total	114	87.0
Less Data	System	17	13.0
Total		131	100

To determine the existence of a correlation between 2 variables, namely by:
a. Hypothesis
Ho: the two variables are not related to each other
H1: both variables have a significant relationship with each other.
b. By looking at the probability numbers
Probability > 0.05, then Ho is accepted.
Probability < 0.05, then Ho is rejected.

Table 10. Relationship between Hypertension and Stroke.

		Stroke Type		Total
		NHS	HS	
Incoming Blood Pressure	Hypertension grade 1	29	5	34
	Hypertension grade 2	57	16	73
Total		86	21	107

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.765[a]	1	**.382**

The table above shows that patients who entered the UKI General Hospital with hypertension (> 140/90mmHg) with stroke events using Chi-Square analysis resulted in a probability value of 0.382 > 0.05, so Ho was accepted, which means there was no relationship between the patient's blood pressure (hypertension) at admission. UKI General Hospital in 2017 with a stroke. However, seen from the frequency distribution of patients' blood pressure when they entered UKI General Hospital (Table 5), more than 50% of stroke patients joined UKI General Hospital in 2017 with grade 2 hypertension as many as 73 people while patients who came with grade 1 hypertension were 34 people. It shows that the statistics used in this study are not appropriate. It may be necessary to use another approach to assess the relationship of hypertension with the incidence of stroke, such as with a clinical statistical system.

Table 11: Relationship between Stroke and Risk Factors.

	Age	Gender	LDL	TBS
Stroke	.039	.326	.685	.643

The table above shows that the incidence of stroke with age using Chi-Square analysis produces a value of 0.039

< 0.05 then Ho is rejected, which means that there is a relationship between stroke and patient age while gender, LDL and GDS produce a probability value > 0.05 then Ho is accepted which means that meaning that there is no relationship between stroke with gender, LDL and TBS.

From 131 stroke patients at UKI General Hospital in 2017, it was found that there were more stroke patients at the age of 60 years and over, which can be seen in Table 11 that there is a relationship between stroke and age. At the age of 60 years and over, the function of blood vessels has decreased or degenerated, causing the blood vessels to become no longer flexible, known as atherosclerosis, which will trigger the occurrence of stroke. Although more strokes occur at the age of more than 60 years, it is possible that at the age of fewer than 60 years, strokes can also occur. Based on this study, the frequency of stroke at fewer than 60 years of age amounted to 63 people (48.1%) and at more than 60 years amounted to 68 people (51.9%), which means that the difference is fragile.

Based on gender, there were more stroke cases in men (58.8%) than women. It can be attributed to the habit of men who smoke and consume alcoholic beverages more often and are reluctant to have their health checked. As a result, there can be damage to the vascular endothelium and the entry of LDL through the damaged vascular endothelium, then LDL will be phagocytosed by monocytes to form foam cells which eventually become atherosclerotic plaques in blood vessels. Atherosclerotic plaques occur as a result of high LDL (Low-Density Lipoprotein) in patients. Table 8 shows that only one stroke patient out of 86 people who had an LDL examination had an LDL test result of less than 100 mg/dL. These plaques cause high blood pressure due to compensation from plaque that accumulates, causing the brain to become deprived of oxygen, causing strokes, especially ischemic strokes, the percentage of which was 83.2% in patients at UKI General Hospital in 2017.

Not only high LDL levels can cause strokes, but hyperglycemia or high blood sugar in the blood can also trigger strokes; as can be seen in Table 9, there are 113 stroke patients with blood sugar levels when more than 200 mg/day. dL. High blood glucose was obtained from the results of this study, namely increasing blood viscosity, disrupting blood flow, especially in the brain. Hyperglycemia also causes injury, damage to the structure and function of the vascular endothelium.[17]

Most of the stroke patients when they entered the UKI General Hospital in 2017 came with grade 2 hypertension (55.7%), thus stating that there was a close relationship between hypertension and the incidence of stroke. Hypertension experienced by patients is generally caused by various factors, namely from the patient's lifestyle such as lack of exercise, excessive salt intake, lack of consuming vegetables and fruits or uncontrolled blood pressure, and patient non-compliance in taking antihypertensive drugs that blood pressure is not controlled can spike and trigger a stroke.[18] It turned out that the patient's blood pressure when he left the hospital was different from the patient's blood pressure when he entered the hospital. Most of the patients who were discharged from the hospital went home with prehypertension (42.7%), only 12 patients returned home with grade 2 hypertension, the patient's return was caused by the patient's wishes or requests from the family. It can indicate the success of the UKI General Hospital in the care and treatment of patients during inpatient and outpatient treatment when viewed from a blood pressure perspective. In addition, it is necessary to consider the existence of an acute stroke phase, namely, when there is a decrease in cerebral blood flow, the brain will autoregulate by increasing blood pressure so that most stroke patients enter the UKI General Hospital with high blood pressure. This high blood pressure compensates for ischemic events, so the decrease in blood pressure in the acute phase must be more careful to avoid extensive brain damage.

CONCLUSION

The highest incidence of stroke at UKI General Hospital Jakarta in 2017 was found in the male gender (58.8%) and at the age above 60 years (51.9%). Based on the blood pressure of stroke patients when they entered UKI General Hospital in 2017. The patients came with normal blood pressure with a percentage of 2.3% when they returned home from UKI General Hospital to 21.4%, patients who came with prehypertension with 16%. When they returned from UKI General Hospital became 42.7% and patients who came with grade 2 hypertension with a percentage of 55.7% when they returned home from UKI General Hospital to 9.2%, it can be concluded that the treatment and treatment at UKI General Hospital were successful when viewed from the blood pressure factor. There was no significant difference in the percentage of hypertension grade 1 between stroke patients who entered the UKI General Hospital and stroke patients when they left the UKI General Hospital. It is related to more than 50% of stroke patients aged over 60 years, according to the Boedhi Darmojo Geriatri Textbook, explaining that around 90% of people aged over 60 years are not hypertensive to be hypertensive grade 1 throughout their life. Jakarta in 2017, with a diagnosis of non-hemorrhagic stroke (83.2%), the results of a low-density lipoprotein examination of more than 100 mg/dL (64.9%) and a blood sugar test result of more than 200 mg/dL (86.3%). There was no relationship between hypertension and the incidence of stroke at UKI General Hospital in 2017 using Chi-Square analysis. However, from the results of the univariate analysis of the distribution of blood pressure frequencies when patients entered the UKI General Hospital (Table 4.3), it was found that there were 73 patients with grade 2 hypertension (55.7%) and 34 patients with grade 1 hypertension (26%).) while there were three patients with normal blood pressure (2.3%) and 21 patients with prehypertension (16%). It shows that more than 80% of stroke patients come with hypertension, so that other statistical approaches such as clinical approaches may be needed to find out more specifically the relationship between hypertension and stroke incidence.

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