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Research Article

# Prevalence of Risk Factors for Stroke Patients at UKI General Hospital in 2015

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### Abstract

Stroke is a disease caused by disturbance of brain blood circulation influenced by many risk factors such as age, blood pressure, blood sugar, and blood lipid level. This study aimed to determine the prevalence of risk factors that contribute to stroke incidence in stroke patients hospitalized at UKI General Hospital in 2015. The design of this study is retrospective with research methodology descriptive observational. The sample in this study is all cases of a stroke at UKI General Hospital in 2015. The result showed that the highest type of stroke is ischemic stroke (77%) with the largest age group of 40-60 years (51.3%), male sex (60 people). Prevalence risk factors are hypertension stage 2 (52,2%), blood glucose level <200 mg/dl (81,4%) low total cholesterol level (47,8%), LDL level borderline high (23%), low HDL level (44,2%).

**Keywords:** stroke, risk factor, the prevalence

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## INTRODUCTION

Stroke is an acute focal or global brain functional disorder due to obstruction of blood flow to the brain due to bleeding (hemorrhagic stroke) or blockage (ischemic stroke) with symptoms and signs according to the part of the brain affected, which can recover completely, heal with a disability, or die.<sup>1</sup> Ischemic stroke occurs due to blockage of blood vessels in the brain, which causes the blood supply to the brain to decrease. If the brain's blood vessels are blocked, blood perfusion to the brain will decrease, which causes a decrease in brain function. The incidence of ischemic stroke is around 70-80% of the total incidence of stroke, while hemorrhagic stroke is an acute, focal or global brain functional disorder due to obstruction of blood flow to the brain caused by cerebral artery bleeding. Blood that comes out of blood vessels can enter the brain tissue, resulting in a hematoma.<sup>2</sup>

Stroke is a cerebrovascular disease that causes the most deaths. According to the World Health Organization (WHO), ischemic stroke and heart disease are the leading causes of death for all age groups. The number of ischemic stroke sufferers who died in the world was around 7.2 million (12.2%), and 5.7 million people (9.7%) from heart disease.<sup>3</sup> Data in the United States shows that the number of patients aged 15-44 years undergoing treatment at a particular stroke hospital increased by more than a third between 1995-2008. This increase is thought to be partly due to the increasing number of young people who have high blood

pressure and type II diabetes mellitus, hyperlipidemia, diseases associated with older adults.<sup>4</sup>

In Indonesia, it is estimated that every year 500,000 people suffer a stroke, around 25% or 125,000 people die, and the rest are mild or severe. Bangka Belitung and DKI Jakarta respectively 9.7%.<sup>5</sup> According to Basic Health Research, strokes are more common in men. When viewed from age, stroke sufferers are primarily found in the 45-54 years, 55-64 years and 65-74 years age groups.<sup>6</sup>

A stroke occurs because of the inability to control or control risk factors. In general, there are two risk factors, namely modifiable factors and non-modifiable factors. Factors that cannot be changed are age, gender, race/ethnicity, and heredity. Factors that can be changed/modified include hypertension, smoking, diabetes mellitus (DM), heart disorders, dyslipidemia, physical exercise, obesity, alcohol, drug abuse, oral contraceptives, sleep pattern disorders, and homocysteine.<sup>7</sup>

Hypertension is the most significant risk factor for coronary heart disease and stroke. Often referred to as the silent killer because hypertension increases the risk of stroke six times. The long-term effect of high blood pressure is the destruction of the artery walls, making the artery walls more susceptible to thickening or narrowing (atherosclerosis) or rupture of blood vessels.<sup>8</sup>

People with diabetes mellitus are more prone to stroke. Diabetes increases the risk of atherosclerosis and increases

the prevalence of hypertension, obesity, and abnormal blood lipid levels. Patients with diabetes have twice the risk of thromboembolic stroke than patients without diabetes.<sup>7</sup>

Although hyperlipidemia is a risk factor for coronary heart disease, the correlation between hyperlipidemia and stroke, high levels of lipids in the blood can spur the emergence of atherosclerosis. The process of atherosclerosis will cause complications in organs, and if it occurs in the brain, it will increase the risk of stroke.<sup>7,8</sup>

Clinical symptoms in patients who have had a stroke are difficulty speaking, numbness or paralysis of the face, hands or feet, difficulty seeing with one or both eyes, dizziness usually accompanied by vomiting, and difficulty walking.<sup>9</sup>

Based on the above background, the authors wish to conduct a study to determine the prevalence of risk factors for stroke patients at Universitas Kristen Indonesia (UKI) General Hospital for 2015. Thus, the problem in this study is formulated in the form of questions: "how the risk factors prevalence in patients with stroke at UKI General Hospital in 2015 period?" With the aim of research to determine the prevalence of risk factors for stroke patients at the UKI General Hospital in 2015.

## LITERATURE REVIEW

The human brain is the most complex structure in the human body, made up of 100 billion nerve cells called neurons. Each neuron is connected to other brain cells. Millions of connections between neurons are needed for the brain to work. The brain regulates body movements, interprets all sensations that the body gets (hearing, seeing, touching, balance, taste, smell, and pain) to think and interpret language.

Although the brain's weight represents 2% of the body's weight, the brain uses about 25% of the body's oxygen and 70% of the body's glucose. Unlike muscles, the brain cannot store nutrients, causing the brain to need a constant supply of glucose and oxygen. If there is a disturbance in blood flow to the brain for about 30 seconds, a decrease in consciousness can occur, and permanent damage to brain tissue can occur if blood flow is interrupted for approximately 4 minutes.<sup>8</sup>

The brain is divided into three parts: the brain stem (brainstem), cerebellum, and cerebrum. The brain stem regulates essential human functions, including breathing, heart rate, regulating body temperature, regulating the digestive process, and is the source of the basic human instinct, namely fight or flight. The cerebellum regulates many automatic functions of the brain, including regulating balance, posture or body position, muscle coordination and body movement.<sup>8,1</sup>

The cerebrum is divided into two hemispheres, the left and right hemispheres. In general, the left hemisphere receives sensation and regulates the movement of the right side of the body, and conversely, the right hemisphere receives sensation and regulates the movement of the left side of the body. Therefore, if a stroke occurs on the left side of the body, it causes weakness in the right side of the body.<sup>8</sup>

Each hemisphere is divided into four lobes. The frontal lobe is at the very front of the brain. This lobe is related to reasoning, motor skills, cognitive abilities, creativity, emotional control, language skills in general. The temporal lobe, located at the bottom of the brain, is associated with hearing, memory, and behaviour. The parietal lobe, which is in the middle, is associated with sensory processes such as pressure, touch, pain and language comprehension in sound.

At the back, the occipital lobe is associated with visual stimuli.<sup>8,10</sup>

The brain's blood supply comes from two pairs of arteries, namely the vertebral arteries and the internal carotid arteries, which branch and anastomose to form the circle of Willis. The internal and external carotid arteries are branches of the common carotid artery ending in the anterior and middle cerebral arteries. At its end, the internal carotid artery becomes the posterior communicating artery, which unites caudally with the posterior cerebral artery. The anterior cerebral arteries are interconnected via the anterior communicating artery. The left and right vertebral arteries arise from the subclavian artery on the same side. The right subclavian artery is a branch of the innominate artery, while the left subclavian artery is a direct branch of the aorta. The vertebral arteries enter the skull through the foramen magnum. These two arteries unite to form the basilar artery.<sup>10</sup>

Brain venous blood flow is very different from venous blood flow in the body. In general, arteries and veins are located side by side, but this differs from the brain. The venous blood flow from the brain is mainly into the dura mater sinuses, a channel of blood vessels contained within the structures of the dura mater. The venous sinuses collect blood from the brain and drain it into the internal jugular vein. The superior and inferior sagittal sinuses drain blood from the cerebrum, and the cavernous sinus drains anterior to the skull base. All sinuses eventually drain into the sigmoid sinus, which exits the skull and forms the jugular vein. These two jugular veins are the central veins of the brain.<sup>10</sup>

Stroke symptoms experienced by patients vary widely, depending on the blood vessels and the part of the brain affected. Brain cells also cannot form new cells. Therefore the brain cannot repair dead cells. If more than 10% of brain tissue is damaged or dies, it can cause paralysis.<sup>8</sup> A stroke is a form of cerebrovascular disease that affects the blood supply to the brain. Stroke is an acute neurologic trauma that occurs as a result of a pathological process affecting the brain's blood vessels and manifests as bleeding or cerebral infarction. Approximately 80% of strokes are due to ischemic cerebral infarction, and 20% are cerebral haemorrhages. The incidence of stroke increases with age. The World Health Organization defines stroke as a clinical manifestation of impaired brain function, both focal and global (overall), which progresses rapidly, lasts more than 24 hours, or causes death, without other causes other than vascular disorders.<sup>8,11</sup>

Stroke is divided into types: Ischemic stroke-Ischemic stroke is a disease that begins with a reduction in blood flow to the brain that lasts more than 24 hours. Reduced blood flow to the brain causes a lack of blood perfusion, resulting in brain neurons being deprived of oxygen and glucose—lack of oxygen and glucose results in neurological deficits. A reduction in blood flow to the brain below 16-18 ml/100g tissue per minute causes infarction within a few hours and a reduction below 20 ml/100g tissue per minute causes ischemia without visible infarction unless the condition persists for several hours or days. The brain that has reduced blood supply can cause brain tissue death within 4-10 minutes, resulting in changes in the colour of brain tissue to become pale.<sup>12</sup>

Hemorrhagic stroke-Hemorrhagic stroke accounts for about 20 to 25% of stroke incidence. Hemorrhagic stroke is a stroke caused by non-traumatic intracranial bleeding. The most common intracranial haemorrhages are intracerebral haemorrhage (ICH) and subarachnoid haemorrhage (PSA).<sup>18</sup>

Intracerebral haemorrhage is the most common intracranial haemorrhage. It occurs about 10% of the total cases of stroke and 50% of death cases in stroke patients. The incidence rate is relatively high, especially in the Asian race and the Negro race.<sup>12</sup>

Intracerebral haemorrhage is caused by rupture of intracerebral blood vessels so that blood leaves the blood vessels and then enters the brain tissue. In this condition, there will be an increase in intracranial pressure so that there is an emphasis on the brain structure or blood vessels of the brain as a whole which results in a decrease in cerebral blood flow and leads to nerve cell death. The occurrence of atherosclerosis will accelerate brain damage. Other risk factors that can cause cerebral haemorrhage are tumours, trauma, arteriovenous malformation (AVM), and stimulant drugs such as cocaine and amphetamines.<sup>8,12</sup>

Intracerebral haemorrhage is common when the patient is conscious and under stress. The onset of symptoms is usually acute with focal neurologic deficits. Focal neurological deficits will worsen over 30-90 minutes and decreased consciousness and increased intracranial pressure such as vomiting and headache. The consciousness of being in a stupor or coma is a sign of upper brainstem compression. Subarachnoid haemorrhage is the entry of blood into the subarachnoid space either from other places (secondary subarachnoid) or from the subarachnoid space itself (primary subarachnoid). Subarachnoid haemorrhage usually results from the formation and rupture of an aneurysm or an arteriovenous vascular malformation.<sup>1,8</sup>

An aneurysm is defined as a cerebrovascular disorder that arises from thinning and degeneration of the artery walls. The causes are congenital abnormalities, hypertension, and the presence of infection or trauma. This condition causes weakness in the walls of blood vessels to form a balloon-like bulge. The protrusion of the blood vessel wall is thinner than the typical blood vessel wall so that it can burst at any time suddenly. The age range for aneurysm rupture is around 40-60 years.<sup>8,13</sup> Arteriovenous malformation (AVM) is a congenital lesion that occurs in a collection of abnormal blood vessels, where F blood flows directly into the veins without capillary intervention normally. Arteriovenous malformations appear as "tangled" blood vessels and most commonly occur in the brain or spinal cord. The walls of blood vessels that occur in AVM are usually thin and have fast blood flow. These conditions can cause easy rupture of blood vessels.<sup>8,12,13</sup> The most common clinical symptom of subarachnoid haemorrhage is acute severe headache. Patients often refer to headaches as "the worst headache of my life". Headaches are often accompanied by other symptoms such as a stiff neck, acute loss of consciousness, nausea and vomiting, intellectual disturbances, and seizures may occur depending on the location and extent of bleeding.<sup>8,13</sup>

Stroke is a disease caused by many multicausal risk factors. Some risk factors for stroke are the same as risk factors for heart disease, although some risk factors are more significant for heart disease than stroke. For example, high blood cholesterol levels are more significant risk factors for heart disease.<sup>8</sup> The following are risk factors for stroke: Blood pressure-Blood pressure is one of the risk factors that must be considered in the incidence of stroke and coronary heart disease. More often referred to as hypertension, high blood pressure is a condition where the systolic blood pressure is more than 140 mmHg, and the diastolic blood pressure is more than 90 mmHg. Hypertension is a significant risk factor, both in ischemic and hemorrhagic stroke, and high blood pressure can be found in 50-70% of

stroke cases. High blood pressure doubles the risk of stroke by four times. The risk of a cerebral haemorrhage in hypertensive patients was 3.9 times higher than in individuals without hypertension. The risk of aneurysmal subarachnoid haemorrhage is 2.8 times higher. Establishing the diagnosis and treatment procedures for hypertension is the primary strategy for stroke prevention. The long-term effect of high blood pressure is the breakdown of the artery walls, making the artery walls more susceptible to thickening or narrowing (atherosclerosis) or rupture of blood vessels.<sup>8,14,15</sup>

Diabetes mellitus-Diabetes mellitus is a group of metabolic disorders characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both [16]. Diabetes mellitus is classified into two types, namely, type 1 diabetes (due to absolute insulin deficiency) and type 2 diabetes (insulin deficiency caused by defects in insulin secretion).<sup>17,18,19</sup> Apart from being a disease, diabetes mellitus is also a risk factor for stroke. People with diabetes have a greater risk of stroke and heart disease.<sup>4</sup> Approximately 33% of patients suffering from ischemic stroke have diabetes mellitus. Insulin resistance is also associated with the first incidence of stroke in patients who do not have diabetes.<sup>11</sup> People with diabetes are prone to atherosclerosis. Atherosclerosis can lead to arteriothrombotic events that increase the risk of ischemic stroke.<sup>15,20</sup>

Blood fat levels- Cholesterol is unsaturated alcohol from a family of steroid compounds found in the bloodstream, organs and nerve fibres. Most of the cholesterol in the body is produced in the liver, and cholesterol is also a precursor of various substances such as adrenal and gonadal steroid hormones and bile acids. Triglycerides are esters derived from fatty acids and glycerol. Triglycerides are the main component of body fat in humans. Since cholesterol and triglycerides are nonpolar lipid substances in plasma, they are transported by proteins. The combination of the two is called a lipoprotein. Lipoproteins are classified into five groups based on their density consisting of chylomicrons, very-low-density lipoprotein (VLDL), intermediate-density lipoprotein (IDL), low-density lipoprotein (LDL), and high-density lipoprotein (HDL). Dyslipidemia is an increase in plasma cholesterol, triglycerides, or both.<sup>22,23</sup>

Plasma lipids and lipoproteins (total cholesterol, triglycerides, low-density lipoprotein (LDL), high-density lipoprotein (HDL)) influence the risk of cerebral infarction, but the relationship between dyslipidemia and stroke has not been established. In general, the risk of stroke can be associated with dyslipidemia. In men, low HDL levels are a risk factor for brain ischemia. In a case study of 11,117 patients with coronary heart disease, high serum triglyceride levels and low HDL levels were significantly associated with cases of cerebral infarction.<sup>15</sup> Age is a risk factor for stroke. Whereas a person's age increases, the risk for stroke also increases. After age 55, the risk of stroke more than doubles. Each year, about 1% of people aged 65 to 74 have a stroke.<sup>8</sup> The pathophysiology of atherosclerosis-atherosclerosis is a vascular disorder characterized by intimal lesions characterized by atheromas (also called atheromatous or atherosclerotic plaques) protruding into the vessel lumen. The local tissue reaction caused by the lesion produces particles and cells that cause build-up and hardening of the vessel wall.<sup>2</sup>

Atherosclerosis can occur due to many risk factors such as hypertension, diabetes mellitus, and hypercholesterolemia. High blood pressure or hypertension causes every heartbeat. The arteries throughout the body will dilate and be more

comprehensive than usual. Over time, stretching the arteries can injure the endothelium in the tunica intima of blood vessels and cause the arteries to stiffen. If the endothelium is injured, the accumulation of cholesterol in the tunica intima will eventually form a fibrous cap or scar tissue over the fat core, which eventually forms atherosclerotic plaques. These plaques tear easily and trigger the formation of blood clots (thrombosis).<sup>26</sup>

High blood sugar or diabetes mellitus affects endothelium cells that can cause atherosclerosis, namely increasing the production of free radicals that cause premature cell death (apoptosis) and reducing the availability of nitric oxide because insulin is a hormone that stimulates the production of nitric oxide. Nevertheless, people with diabetes are resistant to insulin which causes the availability of nitric oxide to decrease. Nitric oxide functions to regulate blood vessel tone (mediator of vasodilation of blood vessels), blood vessel structure (inhibits proliferation of vascular smooth muscle cells). The disruption of nitric oxide formation will disrupt blood vessel tone and structure and cause arteriosclerosis.<sup>25,26</sup> Symptoms and signs of stroke often develop over hours or days. The type of symptoms a patient experiences depends on the area of the brain affected and the type of stroke that occurred. Symptoms and signs often found in patients with acute stroke are<sup>1,9</sup> the presence of attacks of neurological deficits, such as hemiparesis (paralysis of the right or left body).

## RESEARCH METHOD

This study uses a descriptive observational method with a retrospective research design. The study was conducted in the medical records section of the UKI General Hospital in September-October 2016. This study used secondary data, namely the medical records of inpatients with neurological diseases at UKI General Hospital in January-December 2015. The number of samples taken through total sampling, namely all medical records at UKI General Hospital. The sampling technique used is total sampling. The stages of the research are a) Collecting the data collected from the medical records of inpatients with neurological diseases at the UKI General Hospital from January to December 2015, which included the inclusion criteria. The inclusion criteria were all ischemic and hemorrhagic stroke patients, and processing the collected data will be grouped based on the type of stroke and then statistically processed using the Statistical Product and Service Solution (SPSS) program. This study follows the rules following applicable research ethics by keeping the identities of existing patients confidential. Documents regarding identity and data related to research on hypertension profiles in ischemic and hemorrhagic stroke patients are only used for research purposes.

## RESULT AND DISCUSSION

The study was conducted for two months, from September to October, at UKI General Hospital, East Jakarta. The research method used by the researcher is a descriptive observational method with a retrospective research design. This study aimed to determine the prevalence of ischemic and hemorrhagic stroke risk factors in UKI General Hospital. The number of samples collected was 113 stroke inpatient data in the 2015 period. The study was conducted by collecting secondary data, namely medical record data of UKI General Hospital patients. The data that has been collected is processed using SPSS (Statistical Package for Social Science) v23.0 software.

Table 1: Distribution of patients by type of stroke

Type of stroke	Number	%
Ischemic stroke	87	77%
hemorrhagic stroke	26	23%
Total	113	100%

In the results of this study, the proportion of ischemic stroke types is more than hemorrhagic stroke. Table 1 shows that of 113 stroke patients hospitalized at UKI General Hospital, as many as 87 patients (77%) suffered from ischemic stroke, while 26 patients (23%) suffered a hemorrhagic stroke. It is following various studies on other strokes, where the number of ischemic stroke patients is indeed more than hemorrhagic stroke.

Table 2: Patient data by gender

Gender	Stroke		Total
	Ischemic stroke	hemorrhagic stroke	
Male	47	13	60 (53.1%)
Female	40	13	53 (46.9%)
Total	87	26	113 (100%)

From the study results, it was found that in cases of stroke, male patients were more than female patients. From 113 medical recap data, 60 patients (53.1%) were male, and 53 (46.9%) were female. The proportion of men suffering from an ischemic stroke was 47 patients, and hemorrhagic stroke was 13 patients from all male patients. While the proportion of women suffering from an ischemic stroke was 40 patients, and hemorrhagic stroke was 13 patients from all-female stroke patients.

Table 3: Distribution of patients by age

Age	Number	%
<40 year	5	4.4%
40-60 year	58	51.3%
>60 year	50	44.2%
Total	113	100%

In the results of this study, most stroke patients were aged 40-60 years. Table 3 above shows that of the 113 inpatients at UKI General Hospital, as many as 58 patients (51.3%) were aged 40-60 years, 50 patients (44.2%) were over 60 years old, and the remaining five patients (4.4%) under 40 years of age. The risk of stroke increases with age. After 55 years, the risk of stroke has more than doubled. With increasing age, blood vessels tend to undergo degenerative changes, and the process of atherosclerosis begins to appear. The process of atherosclerosis can be a trigger for stroke.

Table 4: Distribution of patients by blood pressure

Blood pressure category	Number	%
Normal (systolic < 120 or diastolic < 80 mmHg)	13	11,5%
Pre-hypertension (systolic 120-139 or diastolic 80-89 mmHg)	12	10,6%
Stage 1 hypertension (systolic 140-159 or diastolic 90-99 mmHg)	29	25,7%
Stage 2 hypertension (systolic 160 or diastolic 100 mmHg)	59	52,2%
Total	113	100%

From the results of this study based on blood pressure, most stroke patients had blood pressure belonging to stage 2 hypertension. Table 4 above shows that of 113 stroke patients hospitalized at UKI General Hospital, as many as 59 patients (52.2%) had blood pressure classified as hypertension stage 2. Meanwhile, 29 patients (25.7%) had blood pressure classified as stage 1 hypertension, followed by pre-hypertension blood pressure in 12 patients (10.6%) and normal blood pressure in 13 patients (11.5%).

Hypertension is a significant risk factor, both in ischemic and hemorrhagic stroke, and high blood pressure can be found in 50-70% of stroke cases. High blood pressure doubles the risk of stroke by four times. The risk of a cerebral haemorrhage in hypertensive patients was 3.9 times higher than in individuals without hypertension<sup>8,14,15</sup> It can also be seen in the study results where most of the stroke patients hospitalized at UKI General Hospital had blood pressure classified as stage 2 hypertension criteria, as many as 59 patients (52.2%).

Furthermore, the following sections will describe sugar levels, lipid levels, and LDL levels in stroke patients.

Table 5: Description of patients based on blood sugar levels at the time

GDS Level	Number	%
<200 mg/dl	92	81,4%
>200mg/dl	14	12,4%
Not inspected	7	6,2%
Total	113	100%

In the study results based on blood sugar at the time, most stroke patients had blood sugar levels of <200mg/dl. Table 5 above shows that from 113 inpatients who were checked for blood sugar levels, 92 patients (81.4%) had low blood sugar levels below <200 mg/dl. While 14 patients (12.4%) had blood sugar levels >200 mg/dl, and seven patients (6.2%) were not checked for blood sugar at any time.

Diabetes mellitus is a modifiable risk factor for stroke. In a person with diabetes mellitus, the risk of stroke is doubled compared to a person without diabetes. It happens because an increase in blood sugar can increase the risk of atherosclerosis and other strokes such as hypertension, obesity, and hyperlipidemia.<sup>28</sup> A person is diagnosed with diabetes mellitus if the classic symptoms of DM and blood sugar levels are 200mg/dl. However, the results showed that most of the stroke patients at the UKI General Hospital had normal blood sugar levels. It may be due to inadequate

laboratory tests and possibly poorly calibrated medical devices that cause research results to differ from theory. For this reason, further detailed examinations are needed, such as fasting blood sugar and blood sugar 2 hours after eating.

Table 6: Overview of patients based on total cholesterol levels

Total cholesterol category	Number	%
Low (<200 mg/dl)	54	47,8%
Moderate (200-239 mg/dl)	28	24,8%
High (≥240 mg/dl)	16	14,2%
Not inspected	15	13,3%
Total	113	100%

In the study results based on total cholesterol, most of the stroke patients had a low total cholesterol level, which was below 200 mg/dl. Table 6 above shows that of 113 stroke patients hospitalized at UKI General Hospital, 54 patients (47.8%) had low total cholesterol levels. Meanwhile, 28 patients (24.8%) had moderate cholesterol. Sixteen patients (14.2%) had high cholesterol levels, and fifteen patients (13.3%) of 113 patients had no total cholesterol levels checked.

Table 7: Description of patients based on LDL levels

LDL Category	Number	%
Optimal (<100 mg/dl)	18	15,9%
Near optimal (100-129 mg/dl)	25	22,1%
High limit (130-159 mg/dl)	26	23%
High (160-189 mg/dl)	18	15,9%
Very high (≥190 mg/dl)	11	9,7%
Not inspected	15	13,3%
Total	113	100%

In the study results based on LDL levels, the highest number of stroke patients was in the category of high limit LDL levels (130-159 mg/dl). Table 7 above shows that out of 113 stroke patients hospitalized at UKI General Hospital, 26 patients (23%) had high limit LDL levels. In contrast, as many as 25 patients (22.1%) had LDL levels close to optimal, followed by optimal and high LDL levels in 18 patients (15.9%). Fifteen patients (13.3%) of the total 113 patients were not checked for LDL levels.

Table 8: Description of patients based on HDL levels

HDL Category	Number	%
Low (<40 mg/dl)	50	44,2%
Moderate (40-59 mg/dl)	39	34,6%
High (≥60 mg/dl)	9	8%
Not inspected	15	13,3%
Total	113	100%

In studies based on HDL cholesterol, stroke patients mostly had low HDL levels (<40 mg/dl). Table 8 above shows that of 113 stroke patients hospitalized at UKI General Hospital, 50

patients (44.2%) had low HDL levels. Meanwhile, 39 patients (34.5%) had moderate HDL levels. Nine patients (8%) had high HDL levels, and 15 patients (13.3%) of 113 patients had not had HDL levels checked. From the various tables above, it can be seen that the incidence of ischemic stroke is more than hemorrhagic stroke. Theoretically, about 80% of strokes are due to ischemic cerebral infarction, and 20% cerebral haemorrhage.<sup>8</sup> It can be seen that the incidence of ischemic stroke in the UKI hospital is 77%, and hemorrhagic stroke is 23%.

The incidence of stroke increases with age.<sup>8</sup> From the study results, it can be seen that the age of 40-60 years has a higher percentage of stroke followed by those aged over 60 years and the smallest under 40 years. With the increasing age of a person, his physiological function will decrease. The body will easily make plaque in the arteries, which can cause atherosclerosis, and insulin resistance occurs, which can cause diabetes mellitus and decreased fat metabolism, which can cause hypercholesterolemia.

Increased blood pressure is a significant risk factor, both in ischemic stroke and hemorrhagic stroke. It can be seen from the study results that as many as 52.2% of patients had grade 2 hypertension, and only 11.5% had normal blood pressure. It indicates that most stroke patients hospitalized at UKI General Hospital have hypertension status or high blood pressure. Hypertension can thin the walls of blood vessels and damage the inside of the blood vessels, causing atherosclerotic plaques, making it easier for blockages or brain bleeding.<sup>1</sup> The study results on patients' blood sugar levels showed that 81.4% of inpatients at UKI General Hospital had low blood sugar levels. These data indicate that most UKI General Hospital patients have strokes not because of a temporary increase in blood sugar levels, leading to diabetes mellitus.

The study results on patients' lipid levels showed that 47.8% of patients had low cholesterol levels, but only 18% of 113 patients had optimal LDL levels, 48.6% of 113 patients had high or very high LDL levels, and 44.2% had low HDL levels. These data indicate that almost 50% of stroke patients hospitalized at UKI General Hospital have high borderline LDL levels and low HDL levels. LDL tends to stick to the walls of blood vessels to constrict blood vessels, and HDL functions to transport fat deposits from the walls of blood vessels. HDL levels that are too low and LDL levels high can trigger plaque formation in the arteries and potentially inhibit the body's blood flow, including blood flow to the brain [29].

## CONCLUSION

Based on the results of the study "Prevalence of Stroke Risk Factors at UKI General Hospital for the 2015 Period", it was found: a) Characteristics of stroke patients at UKI General Hospital were primarily male (53.1%) and aged between 40-60 years (51.3%) and b) The description of the risk factors for stroke patients at the UKI General Hospital has more categories of blood pressure stage 2 hypertension (52.2%), blood sugar levels <200mg/dl (81.4%), low total cholesterol levels (47, 8%), borderline high LDL levels (23%), and low HDL levels (44.2%). For this reason, it is hoped that doctors can identify and detect stroke risk factors early so that the incidence of stroke can decrease.

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