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Description of Characteristics, Lipid Profile, Blood Pressure, and Location of Bleeding in Hemorrhagic Stroke Patients at Waled Hospital for the Period of January-May 2024

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KEYWORDS
Characteristics; Lipid Profile; Blood Pressure; Location of Bleeding; Hemorrhagic Stroke.

ABSTRACT
Hemorrhagic stroke is a bleeding condition caused by the rupture of an aneurysm that forms in a blood vessel in the brain. This aneurysm can develop due to several factors, including age, gender, hypertension, and lipid profile levels. Low cholesterol levels can damage the endothelium and cause necrosis, making blood vessels fragile and prone to rupture, which leads to bleeding. Conversely, high cholesterol levels can disrupt endothelial function, making blood vessels more susceptible to the formation of microaneurysms. This condition is further aggravated by hypertension, which can cause blood vessels to burst and result in bleeding. Hypertension and total cholesterol levels play a significant role in the incidence of hemorrhagic stroke. Meanwhile, there has been limited research examining the effects of LDL, HDL, and triglyceride levels on hemorrhagic stroke. This study aimed to describe the characteristics, lipid profiles, blood pressure, and bleeding locations of hemorrhagic stroke patients at Waled Hospital during January–May 2024. This research employed an observational descriptive method with a cross-sectional design. The study found that the most common age group affected was the elderly (30%), with no significant difference in frequency between genders. LDL levels were mostly within the normal range (40%), HDL levels were predominantly in the moderate category (50%), triglyceride levels were generally normal (70%), total cholesterol levels were largely normal (63%), and many patients suffered from grade 3 hypertension (60%). The most common bleeding site was the basal ganglia region (50%). In summary, the characteristics of hemorrhagic stroke patients were predominantly elderly, with no significant gender difference. Their lipid profile levels tended to be within normal ranges, many suffered from hypertension, and the bleeding location was most frequently found in the basal ganglia.

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INTRODUCTION

Stroke is a focal (or global) neurological deficit that occurs suddenly, lasts more than 24 hours, and is caused by vascular factors. Stroke is classified into two categories: ischemic stroke and hemorrhagic stroke. Hemorrhagic stroke (hemorrhage) is a condition of bleeding into brain tissue (intracerebral hemorrhage) or bleeding into the subarachnoid space. Hemorrhagic stroke is caused by the rupture of an aneurysm in the parenchyma of the brain or in the cavity between the brain and the skull, causing ischemia and increased pressure on the brain tissue (American Heart Association in Puti) (Alipio & Manalo, 2019; Boswell, 2020; Istichomah & Andika, 2022; Priambodo et al., 2024; Safri, 2022).

The incidence of intracerebral hemorrhage increases after the age of 55. The incidence of hemorrhagic stroke increases with age and is more common in men. Other factors such as

hypertension and low total cholesterol levels can cause damage or rupture of blood vessels. Common locations of bleeding in the brain are the basal ganglia (50%), cerebral lobe (10%–20%), thalamus (15%), pons and brainstem (10%–20%), and cerebellum (10%) (Alhashim et al., 2022; De Bhailis & Kalra, 2022; Hari et al., 2023; Marchidann, 2023; Watanabe et al., 2023).

Cholesterol is a complex fatty compound produced by the body for various functions, such as forming cell walls. When cholesterol levels are low, they can cause damage to the tunica media endothelium. This leads to blood plasma infusion and histolysis, resulting in fibrinoid formation. The fibrinoid located on the tunica intima eventually causes necrosis, making the tunica intima stiff, hard, and brittle. By increasing the fragility of blood vessels, this condition causes them to rupture easily and leads to intracerebral hemorrhage (hemorrhagic stroke). Physiologically and for clinical diagnosis, there are four cholesterol components that play an important role: LDL, HDL, triglycerides, and total cholesterol (Glavinovic et al., 2022; Nemes et al., 2016; Salih, 2021; Schade et al., 2020; von Eckardstein et al., 2023).

In a study conducted by Kurnia Lutfi Fauzia Rahayu et al., it was found that the non-hypercholesterolemia group was more prevalent, with 29 out of 40 hemorrhagic stroke patients, compared to the hypercholesterolemia group. In a study by Pamela et al. (2019) conducted on elderly women, an increased risk of hemorrhagic stroke was found in those with LDL-C <70 mg/dL and a potentially increased risk in those with LDL-C ≥160 mg/dL. It was also observed that there was an increased risk of hemorrhagic stroke, especially SAH, among individuals with low triglyceride levels. Hypercholesterolemia is a risk factor for ischemic stroke, but total cholesterol and low-density lipoprotein (LDL-C) levels are inversely proportional to the risk of hemorrhagic stroke, while no association was found for high-density lipoprotein (HDL-C) cholesterol (Alloubani et al., 2021; Banach et al., 2022; Goldstein et al., 2023; Ma et al., 2019; Wang et al., 2019).

Every year, 10 million people worldwide suffer a stroke. Among them, 5 million die and another 5 million experience permanent disability and require assistance with daily activities (WHO in Puspitasari, 2020). Based on research by the Ministry of Health of the Republic of Indonesia, the number of stroke patients diagnosed by health workers in 2018 was estimated at 10.9 per 1,000 Indonesians. According to RISKESDAS 2018, the prevalence of stroke in the population aged 15 years and above based on medical diagnosis is 10.9%, or an estimated 2,120,362 people. The prevalence of stroke in West Java increased to 11.4% in 2018, and West Java has the highest estimated number of stroke patients based on diagnosis and symptoms by health workers, namely 238,001 people (7.4%) and 533,895 people (16.6%).10 Based on the results of RISKESDAS 2013, in Cirebon Regency, the prevalence of stroke is 5.7% of the total population of 2,159,577.11 In 2019, the prevalence of hemorrhagic stroke worldwide among all stroke events was 27.9% (3.41 million) for intracerebral hemorrhage and 9.7% (1.18 million) for subarachnoid hemorrhage.

Based on the prevalence and background data above, the researcher is interested in conducting a study entitled “Description of Characteristics, Lipid Profile, Blood Pressure, and Bleeding Location in Hemorrhagic Stroke Patients at Waled Hospital for the January–May 2024 Period.

METHOD

The research was observational descriptive and used a cross-sectional design. There were 51 patients with Hemorrhagic Stroke for the January-May 2024 period, but only 30 patients were included in this study. Hemorrhagic Stroke patients at Waled Hospital who meet the inclusion criteria of the researcher. The sampling technique uses total sampling. Data were obtained from secondary sources, namely the medical records of hemorrhagic stroke patients at Waled Hospital for the period January–May 2024. The data collected included patient identity (age and gender), laboratory results of lipid profiles, blood pressure measurements recorded upon admission, and radiological findings from head CT-Scan examinations. Data were analyzed using univariate analysis to describe the frequency distribution and percentage of each variable. The results were presented in the form of frequency distribution tables and narratives. All analyses were performed using statistical software. This study was conducted after obtaining research permission from the relevant institutional ethics committee and the management of Waled Hospital. Patient data were kept confidential and used solely for research purposes in accordance with applicable ethical principles.

RESULT AND DISCUSSION

Data taken from the sample included age, gender, lipid profile, blood pressure, and *CT-Scan results*.

Age

The age characteristics of hemorrhagic stroke patients at Waled Hospital are presented in the following table:

Table 1. Age characteristics

Age	(n)	%
Early adulthood	0	0%
Late Adulthood	5	17%
Early Elderly	8	27%
Late elderly	8	27%
Elderly mass	9	30%
Total	30	100%

Source: Medical record data of hemorrhagic stroke patients at Waled Hospital (January–May 2024)

Based on this study, the patients who had a lot of hemorrhagic strokes were mostly seniors with a total of 9 patients (30%).

Gender

The gender characteristics of hemorrhagic stroke patients at Waled Hospital are presented in the following table:

Table 2. Sex characteristics

Gender	(n)	%
Male	15	50%
Women	15	50%
Total	30	100%

Source: Medical record data of hemorrhagic stroke patients at Waled Hospital (January–May 2024)

Univariate Analysis

Lipid profile

The lipid profile levels of hemorrhagic stroke patients at Waled Hospital are presented in the following table:

a) LDL

The LDL levels of hemorrhagic stroke patients at Waled Hospital are presented in the following table:

Table 3. Distribution of patient frequency based on LDL levels

LDL	(n)	%
Low	0	0%
Optimal	5	17%
Normal	12	40%
Height limit	5	17%
Height	5	17%
Very high	3	10%
Total	30	100%

Source: Medical record data of hemorrhagic stroke patients at Waled Hospital (January–May 2024)

In the table above, it can be seen that out of 30 patients, the LDL levels of hemorrhagic stroke patients were mostly at normal levels, namely 12 patients (40%).

b) HDL

The HDL levels of hemorrhagic stroke patients at Waled Hospital are presented in the following table:

Table 4. Distribution of patient frequency based on HDL level

HDL	(n)	%
Low	6	20%
Medium	15	50%
Height	9	30%
Total	30	100%

Source: Medical record data of hemorrhagic stroke patients at Waled Hospital (January–May 2024)

In the table above, it can be seen that out of 30 patients, HDL levels of hemorrhagic stroke patients were mostly at moderate levels, namely 15 patients (50%) and a small number with low levels, namely 6 patients (20%).

c) Triglycerides

Triglyceride levels of hemorrhagic stroke patients at Waled Hospital are presented in the following table:

Table 5. Distribution of patient frequencies based on triglyceride levels

Triglyceride	(n)	%
Low	4	13%
Optimal	21	70%
Height limit	3	10%
Height	2	7%
Very high	0	0%
Total	30	100%

Source: Medical record data of hemorrhagic stroke patients at Waled Hospital (January–May 2024)

In the table above, it can be seen that out of 30 patients, triglyceride levels of hemorrhagic stroke patients were mostly at optimal levels, namely 21 patients (70%).

d) Total cholesterol

The total cholesterol levels of hemorrhagic stroke patients at Waled Hospital are presented in the following table:

Table 6. Distribution of patient frequency based on total cholesterol levels

Total cholesterol	(n)	%
Low	1	3%
Normal	19	63%
Medium	7	23%
Height	3	10%
Total	30	100%

Source: Medical record data of hemorrhagic stroke patients at Waled Hospital (January–May 2024)

In the table above, it can be seen that out of 30 patients, the total cholesterol levels of hemorrhagic stroke patients were mostly at normal levels, namely 19 patients (63%) and a small number with low levels, namely 1 patient (3%).

Blood pressure

The blood pressure of hemorrhagic stroke patients at Waled Hospital is presented in the following table:

Table 7. Distribution of patient frequencies based on blood pressure

Blood Pressure	(n)	%
Optimal	0	0%

Blood Pressure	(n)	%
Normal	0	0%
Normal height	1	3%
Hypertension 1	3	10%
Hypertension 2	8	27%
Hypertension 3	18	60%
Total	30	100

Source: Medical record data of hemorrhagic stroke patients at Waled Hospital (January–May 2024)

In the table above, it can be seen that out of 30 patients, the blood pressure of hemorrhagic stroke patients mostly had hypertension 3, namely 18 patients (60%).

Bleeding Location on CT-Scan

The location of bleeding on the *CT-Scan* of hemorrhagic stroke patients at Waled Hospital is presented in the following table:

Table 8. Distribution of patient frequencies based on Bleeding location on CT-Scan

Location	(n)	%
Basalis ganglia	15	50%
Non ganglia basalis	11	37%
Brainstem and cerebellum	4	13%
Total	30	100%

Source: *Medical record data of hemorrhagic stroke patients at Waled Hospital (January–May 2024)*

In the table above, it can be seen that out of 30 patients, the location of bleeding mostly occurred in the basal ganglia area (50%) in hemorrhagic stroke patients at Waled Hospital.

Age Characteristics of Hemorrhagic Stroke Patients at Waled Hospital

The sample in this study consisted of data from 30 stroke patients from January to May 2024. The results of this study show that hemorrhagic stroke patients were mostly of elderly age. Table 1 shows that the elderly age group accounted for 9 patients (30%). Stroke is a disease of older age, and its incidence increases after the age of 45. This is in accordance with research conducted by Maydinar (2017), which states that many strokes occur at the age of 45 years and above. This is because the function of body organs begins to decline, especially the elasticity of blood vessels at that age. Blood vessels that lose their elasticity become thicker, their lumen narrows, and blood flow to the brain is reduced. If there are other factors such as high blood pressure, this will worsen and accelerate disruption of blood flow to the brain and, over a long period of time, cause rupture of blood vessels in the brain.

Gender characteristics in hemorrhagic stroke patients at Waled Hospital

In this study, there was no difference in the sex distribution of hemorrhagic stroke patients at *Waled Hospital*, as seen in Table 10, with 15 male patients (50%) and 15 female patients (50%). Gender is also a risk factor for hemorrhagic stroke. This study is in line with research conducted by Nuzula Fikrin et al. (2019), which also found no difference in sex

frequency, with 45 male and 45 female patients. Men have a higher lifetime incidence of stroke. Men have a greater risk of stroke than women because they tend to smoke more and more frequently experience hypertension or systemic heart disease, which are risk factors for stroke.16 Meanwhile, women have a higher prevalence rate in older age due to the increased risk of stroke with aging. Adult women are also vulnerable to stroke due to several factors such as the use of oral contraceptives, pregnancy, and menopause.

In this study, most female patients were over 45 years old. In the age range of 45–55 years, many women tend to enter the menopausal phase. In this phase, women have a higher risk of stroke, which is related to the hormone estrogen. Estrogen has a protective effect on the cardiovascular system. Estrogen can prevent adverse structural changes in the heart. Its vasodilatory properties, which facilitate the widening of blood vessels, lead to smoother blood flow and a reduced workload on the heart as a pump. Indirectly, estrogen can be beneficial in improving the efficiency of body fat metabolism, especially in preventing excessive LDL accumulation. In the menopausal phase, this hormone decreases, leading to a reduction in the positive effects of estrogen as a protective factor against stroke.

Lipid profile in hemorrhagic stroke patients at Waled Hospital

In this study, the lipid profile parameters assessed were LDL, HDL, triglycerides, and total cholesterol levels. In the lipid profile table, LDL levels were more frequently in the normal category, with 12 patients (40%); patients with moderate HDL levels were more common, totaling 15 patients (50%); triglyceride levels were predominantly at optimal levels in 21 patients (70%); and normal total cholesterol levels were found in 19 patients (63%). Another study conducted by Theresia et al. (2021) showed that, among 62 samples, normal total cholesterol levels were found in 29 people (12 hemorrhagic stroke patients and 17 ischemic stroke patients), and high cholesterol levels were found in 33 people (7 hemorrhagic stroke patients and 26 ischemic stroke patients). Normally, the function of cholesterol is to strengthen and stabilize blood vessel walls and provide resistance against high blood pressure.

Total cholesterol levels play a role in the incidence of hemorrhagic stroke, whereas LDL, HDL, and triglycerides have not yet been extensively studied regarding their effects on hemorrhagic stroke. The study by Valappil et al. (2007), which analyzed 74 ICH patients, showed that mean total cholesterol levels were significantly lower in the ICH group than in the control group, with a significant decrease in LDL and triglycerides and no difference in HDL levels between the two groups.

If cholesterol and triglyceride levels are low, the function of cell membranes cannot proceed properly. When cholesterol is low, erythrocytes become more fragile, and platelet clotting ability is reduced. Necrosis of medial arterial smooth muscle cells is also triggered by low cholesterol levels in blood vessels. Low serum cholesterol levels are also thought to cause damage to the tunica media endothelium, forming fibrinoids through plasma infiltration and tissue lysis. Fibrinoid deposits in the tunica intima cause necrosis, resulting in the intima becoming stiff, hard, and brittle. Low cholesterol levels can also increase blood vessel fragility, cause bleeding, and worsen hemorrhagic stroke through intracerebral hemorrhage, thereby increasing mortality and morbidity. Meanwhile, high cholesterol levels are considered to interfere with endothelial function. In chronic hyperlipidemia, lipoproteins that accumulate in the tunica intima can lead to endothelial hyperpermeability. The endothelium becomes thinned,

and blood vessels become more fragile. Microaneurysms tend to form when the endothelium is weakened.

Blood pressure in hemorrhagic stroke patients at Waled Hospital

In this study, many hemorrhagic stroke patients at *Waled Hospital* had grade 3 hypertension, with 18 patients (60%) as shown in Table 15, with blood pressure ≥180/≥110 mmHg. Another study conducted by Maydinar (2017) also showed that most hemorrhagic stroke patients had hypertension as a risk factor. This occurs because, in people with hypertension, blood vessels experience changes in wall elasticity and can tear easily, increasing the risk that fat emboli are carried into the small blood vessels of the brain, causing blockage of blood flow and even rupture of cerebral blood vessels, resulting in hemorrhagic stroke.

Stroke and blood pressure have a strong and continuous relationship. Long-standing high blood pressure will cause damage to the tunica media of small arteries in the brain, weakening the vessel walls and making them prone to rupture. Chronic hypertension causes aneurysm formation in the small blood vessels of the brain. Turbulent blood flow leads to cell and tissue necrosis. Herniation of the arterial wall and rupture of the tunica intima then occur, forming microaneurysms. These microaneurysms can rupture when arterial blood pressure rises suddenly. Under normal conditions, the brain has an autoregulatory system in its cerebral blood vessels to maintain cerebral blood flow. If blood pressure increases, vasoconstriction of cerebral blood vessels occurs; conversely, if blood pressure decreases, vasodilation occurs. In hypertension, blood pressure remains markedly elevated over a long period. This causes hyalinization of vessel walls, resulting in loss of elasticity. Cerebral blood vessels then have difficulty adapting to fluctuations in blood pressure, and a sudden increase in blood pressure can cause rupture of these blood vessels.

Bleeding location based on CT-scan results of hemorrhagic stroke patients

The bleeding location observed from CT-scan results showed that most patients had hemorrhage in the basal ganglia area, with 15 patients (50%). This is in line with research conducted by Nuzula Fikrin et al. (2019), which showed that the most common bleeding location in ICH stroke patients was the basal ganglia/capsular region (42.22%), followed by the lobar region (32.22%). Another study by Koivunen et al. (2014) also reported that in ICH stroke patients aged 16–49 years, the most frequent bleeding location was the basal ganglia/internal capsule (44%).14 Hypertensive hemorrhagic strokes occur in the deep structures of the brain that are supplied by penetrating arteries, such as the basal ganglia area (50%), pons and brainstem (10%–20%), and cerebellum (10%). Meanwhile, lobar strokes that occur in elderly patients are associated with cerebral amyloid angiopathy. The bleeding site helps determine symptoms and clinical course. The more lateral and smaller the hematoma, the more likely it is that brainstem structures are spared and the prognosis is better. In cases of small hemorrhage, patients usually remain conscious, with predominant complaints such as headache, nausea, vomiting, or vertigo. In contrast, large hemorrhages are often associated with decreased consciousness.

CONCLUSION

This section should emphasize the key interpretations and conclusions of the paper. The conclusion should present the main points of this article briefly, narratively, without bullets, and in a conceptual manner. This section should highlight the principal interpretations and conclusions of the study and their significance. The findings should align with the research objectives, and the impact of the research should be clearly stated. Based on these findings, it is recommended that healthcare providers prioritize hypertension screening and management, particularly in elderly populations, as blood pressure control remains the most critical modifiable risk factor for hemorrhagic stroke. Although lipid profiles were largely normal in this study, regular monitoring remains advisable given the complex role of cholesterol in vascular health. Hospitals should improve the completeness of medical record documentation to support future research and quality improvement initiatives. At the community level, public health programs should focus on increasing awareness of hypertension, promoting treatment adherence, and encouraging healthy lifestyles. Further research with larger sample sizes and analytical designs is needed to more definitively explore the relationship between lipid profiles and hemorrhagic stroke risk, as well as to evaluate patient outcomes and long-term prognosis.

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