

## Characteristics of Lipid Profile Levels in Ischemic Stroke Patients at Ibnu Sina Hospital 2023

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ARTICLE INFO	ABSTRACT
<p><b>Manuscript Received:</b> 13 Oct, 2024  <b>Revised:</b> 15 Nov, 2024  <b>Accepted:</b> 15 Nov, 2024  <b>Date of Publication:</b> 9 Dec, 2024  <b>Volume:</b> 7  <b>Issue:</b> 12  <b>DOI:</b> <a href="https://doi.org/10.56338/mppki.v7i12.6377">10.56338/mppki.v7i12.6377</a></p>	<p><b>Background:</b> Stroke is a clinical sign that develops suddenly due to focal (or global) brain function disorders with symptoms that last for 24 hours or more, and can cause death. This study aims to determine the characteristics of lipid profile levels in ischemic stroke patients at Ibnu Sina Hospital, Makassar, January - June 2023.</p> <p><b>Method:</b> The research used is a quantitative research type with a descriptive research design, using medical record data from Makassar Hospital which aims to determine the description of lipid profile levels in ischemic stroke patients at Ibnu Sina Hospital Makassar.</p> <p><b>Result:</b> This study showed that 70 people (58%) of the total sample experienced an increase in total cholesterol levels and 50 people (42%) were within normal limits. 65 people (50%) of the total sample experienced an increase in LDL levels and 65 people (50%) were within normal limits. 82 people (63%) of the total sample experienced a decrease in HDL levels and 48 people (37%) were within normal limits. And 105 people (81%) of the total sample experienced an increase in triglyceride levels and 25 people (19%) were within normal limits.</p> <p><b>Conclusion:</b> This study concluded that 70 people (58%) of the total sample experienced an increase in total cholesterol levels and 50 people (42%) were within normal limits. 65 people (50%) of the total sample experienced an increase in LDL levels and 65 people (50%) were within normal limits. 82 people (63%) of the total sample experienced a decrease in HDL levels and 48 people (37%) were within normal limits. And 105 people (81%) of the total sample experienced an increase in triglyceride levels and 25 people (19%) were within normal limits.</p>
<p><b>KEYWORDS</b></p> <p>Lipid Profile Level;            Ischemic Stroke;            Ibn Sina Hospital</p>	
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### INTRODUCTION

The definition of stroke according to the World Health Organization (WHO) is clinical signs that develop suddenly due to focal (or global) brain dysfunction, with symptoms lasting 24 hours or more, (can cause death) and are considered to occur due to blood vessel disorders. Stroke consists of two types, namely ischemic stroke, and hemorrhagic stroke, where hemorrhagic stroke is divided into intracerebral hemorrhage and subarachnoid hemorrhage (1,2) According to data from WHO, 15 million people in the world suffer from strokes each year. Of that number, 5 million patients end up dying and 5 million others suffer from permanent disabilities. Stroke is ranked 3rd as a cause of death after heart disease and cancer in the United States and the leading cause of long-term disability in developed countries. Every year around 795,000 people experience a stroke in the United States. 600,000 cases are the first attack while 185,000 are cases of recurrent strokes (2).

This is in line with the results of the Basic Health Research (Riskesdas) in Indonesia in 2007-2018 that there is a tendency for an increase in the prevalence of non-communicable diseases, such as stroke (Health Research and

Development Agency 2021). The prevalence of stroke in 2018 increased to 10.9% from 7% in 2013. Based on the diagnosis of doctors in the Indonesian population aged  $\geq 15$  years, the prevalence of stroke in 2018 was 10.9%, which is estimated to reach 2,120,362 people. East Kalimantan Province is in first place with the highest stroke prevalence of 14.7% and Papua is in last place with a prevalence of 4.1%. Based on age group, stroke occurs more often in individuals aged 55-64 years (33.3%). Women and men have almost the same proportion of stroke incidence, namely 49.9% and 50.1% respectively. Based on the last education, most individuals who have strokes graduated from elementary school with a figure of 29.5%. Stroke sufferers mostly live in urban areas as much as 63.9%, while those who live in rural areas are as much as 36.1% (Ministry of Health of the Republic of Indonesia 2019). According to the latest data on the Indonesian health profile in the National Health Insurance (JKN) program in 2020, stroke is in third place with a total of 1,789,261 cases. Stroke cases in South Sulawesi based on the 2018 Basic Health Research of South Sulawesi Province showed the prevalence of stroke in South Sulawesi Province was 10.6%. The highest prevalence of stroke was in the age group  $\geq 75$  years (48.2%) (3).

Included in the standard lipid profile examination are cholesterol, Low Density Lipoprotein (LDL) cholesterol, High Density Lipoprotein (HDL) Cholesterol, and triglycerides. The types of lipids above are transported in lipoprotein particles and differ in size, density, surface lipid composition, specific apolipoproteins, and their functions (4). Cholesterol plays an important role in the process of atherosclerosis. Cholesterol is a fatty substance that circulates in the blood, produced by the liver and is very necessary for the body, but excess cholesterol will cause problems especially in blood vessels, heart and brain. There are 2 important types of cholesterol, namely HDL cholesterol and LDL cholesterol. If LDL cholesterol is excessive in the blood, it will be deposited on the walls of blood vessels and form clots that can block blood vessels, while HDL cholesterol has the function of cleaning blood vessels from excess LDL cholesterol. Findings from the Copenhagen city heart study found a relationship between triglyceride concentrations and the risk of ischemic stroke. Triglyceride concentrations are also statistically more significant in predicting recurrent stroke (5). Therefore, this study aims to determine the characteristics of lipid profile levels in ischemic stroke patients at Ibnu Sina Hospital Makassar in the period January - June 2023.

## **METHOD**

The type of research used in this study is a quantitative research type with a descriptive research design, using medical record data from Makassar Hospital which aims to determine the description of lipid profile levels in patients with ischemic stroke at Ibnu Sina Hospital Makassar. The sample in this study was taken using a non-probability sampling type, namely the purposive sampling technique with samples of ischemic stroke patients who underwent blood lipid profile examinations that met the inclusion and exclusion criteria. The sample in this study used the Slovin formula of 131 people.

### **Inclusion and Exclusion Criteria**

#### **Inclusion Criteria**

Inclusion criteria are general characteristics of research subjects from a target population that is reachable and has been studied. In this study, the inclusion criteria are as follows: 1) Patients diagnosed with ischemic stroke who have laboratory cholesterol examinations in the form of total cholesterol, LDL, HDL, triglycerides in the medical record. 2) The results of the patient's cholesterol examination were taken at the time of initial diagnosis. 3) Patients diagnosed with ischemic stroke with other diagnoses.

#### **Exclusion criteria**

The exclusion criteria are to eliminate or remove subjects who meet the inclusion criteria from the study for reasons (6). The exclusion criteria in this study are as follows: 1) Ischemic stroke patients in the medical record who have incomplete lipid profile examinations. 2) Patients who have been given statins.

## **RESULTS**

### **Distribution of Ischemic Stroke Patients at Ibnu Sina Hospital Makassar in 2023**

Based on the results of the research that has been conducted, the following data on the distribution of total cholesterol levels were obtained:

**Table 1.** Description of Ischemic Stroke Patients

Gender	Man		Woman	
	n	%	n	%
<b>Total Cholesterol</b>				
Normal (<200 mg/dl)	28	66,30%	32	68,10%
Tall (>200 mg/dl)	55	33,70%	15	31,90%
Total	83	100%	47	100%
<b>LDL</b>				
Normal (<135 mg/dl)	43	51,80%	22	52,40%
Tall (>135 mg/dl)	40	48,20%	25	47,60%
Total	83	100%	47	100%
<b>HDL</b>				
Normal (>35,5 mg/dl)	55	66,30%	37	64,90%
Tall (<35,5 mg/dl)	28	33,70%	20	35,10%
Total	83	100%	4700%	100%
<b>Triglycerida</b>				
Normal (<200 mg/dl)	71	85,50%	34	72,30%
Tall (>200 mg/dl)	12	14,50%	13	27,70%
Total	83	100%	4700%	100%

In terms of gender, table 4.0 shows that there are more male sufferers than female sufferers. The lipid profile levels of total cholesterol were found in men as much as 95% compared to women as much as 5%. For LDL (low density lipoprotein) in men, it was found as much as 73% while in women it was found as much as 27%. HDL (high density lipoprotein) was found as much as 53% while in women it was found as much as 47% and for triglycerides in men it was found as much as 48% and for women it was found as much as 52%.

#### Distribution of Total Cholesterol Levels

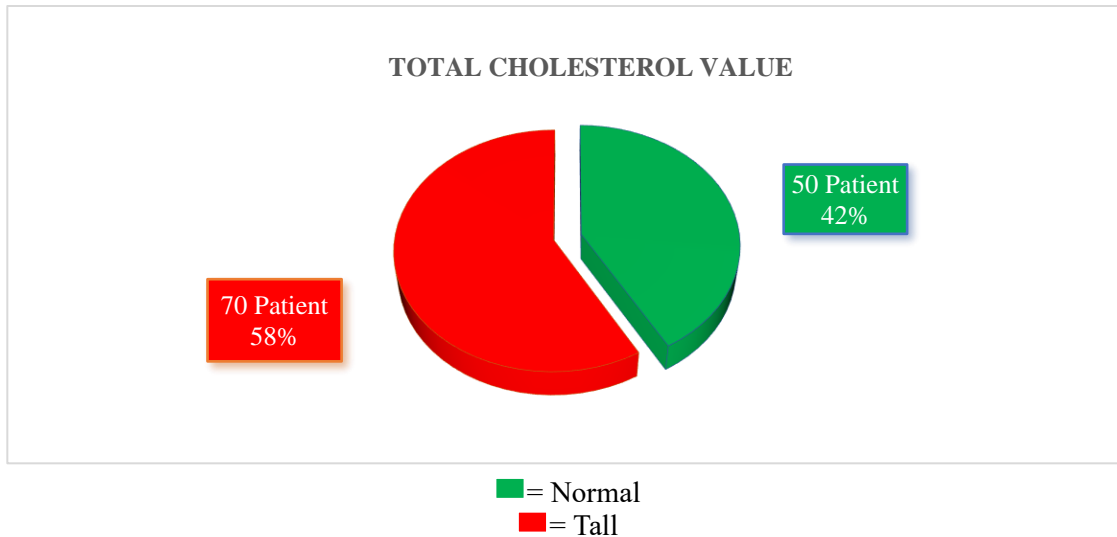
Based on the results of the research that has been conducted, the following data were obtained on the distribution of total cholesterol levels:

**Table 2.** Description of Total Cholesterol Levels in Ischemic Stroke Patients

Total Cholesterol Level	Frequency (N)	Percentage (%)
Normal (<200 mg/dl)	50	42%
Tall (>200 mg/dl)	70	58%
Total	130	100%

Source: Secondary Data, 2023

Judging from the total cholesterol levels, Table 4.1 shows that the highest number of people with elevated total cholesterol levels was 58% of the population obtained, while the population with normal total cholesterol was 42%.



**Diagram 1.** Distribution of Ischemic Stroke Patients Based on Total Cholesterol Levels in Patients Treated at Ibnu Sina Hospital Makassar in the Period January-June 2023

**Distribution of LDL Levels**

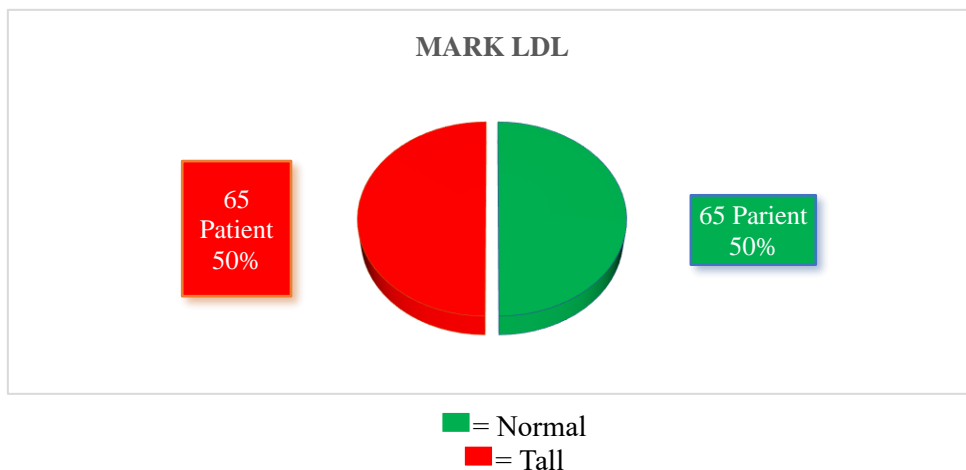
Based on the results of the research that has been conducted, the distribution data for LDL levels are as follows:

**Table 3.** Description of LDL Levels in Ischemic Stroke Patients

LDL levels	Frequency (N)	Percentage (%)
Normal (<135 mg/dl)	65	50%
Tall (>135 mg/dl)	65	50%
Total	130	100%

Source: Secondary Data, 2023

Reviewed from LDL, a table can be obtained that shows that elevated LDL levels have been found in 50% and the population with normal LDL is 50%.



**Diagram 2.** Distribution of Ischemic Stroke Patients Based on LDL Levels in Patients Treated at Ibnu Sina Hospital Makassar in the Period January-June 2023

**Distribution of HDL Levels**

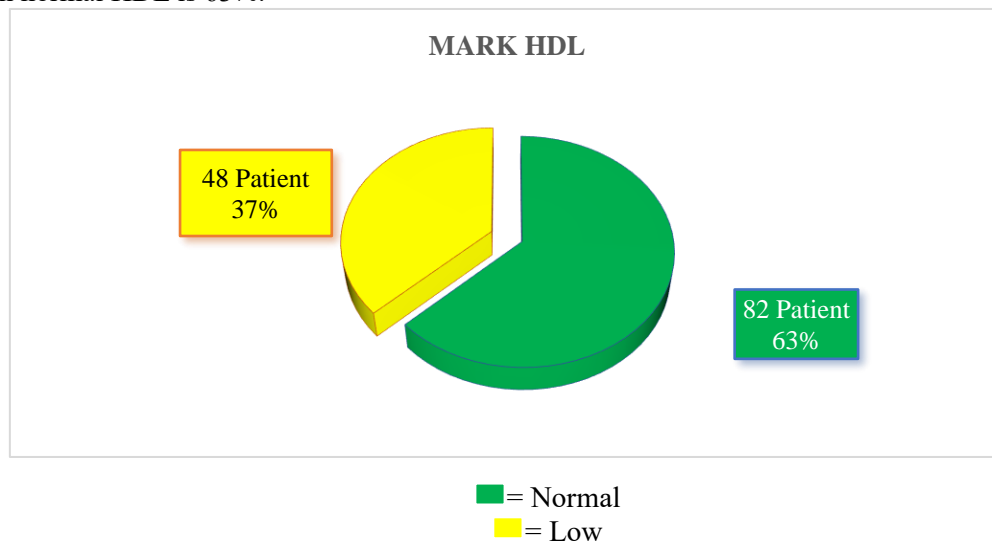
Based on the results of the research that has been conducted, the distribution data for HDL levels are as follows:

**Table 4.** Description of HDL Levels in Ischemic Stroke Patients

LDL levels	Frequency (N)	Percentage (%)
Normal (>35,5 mg/dl)	82	63%
Low (< 35,5 mg/dl)	48	37%
Total	130	100%

Source: Secondary Data, 2023

Reviewed from HDL, a table can be obtained showing that low HDL levels have been found in 37% and the population with normal HDL is 63%.



**Diagram 3.** Distribution of Ischemic Stroke Patients Based on HDL Levels in Patients Treated at Ibnu Sina Hospital Makassar in the Period January-June 2023

**Distribution of Triglyceride Levels**

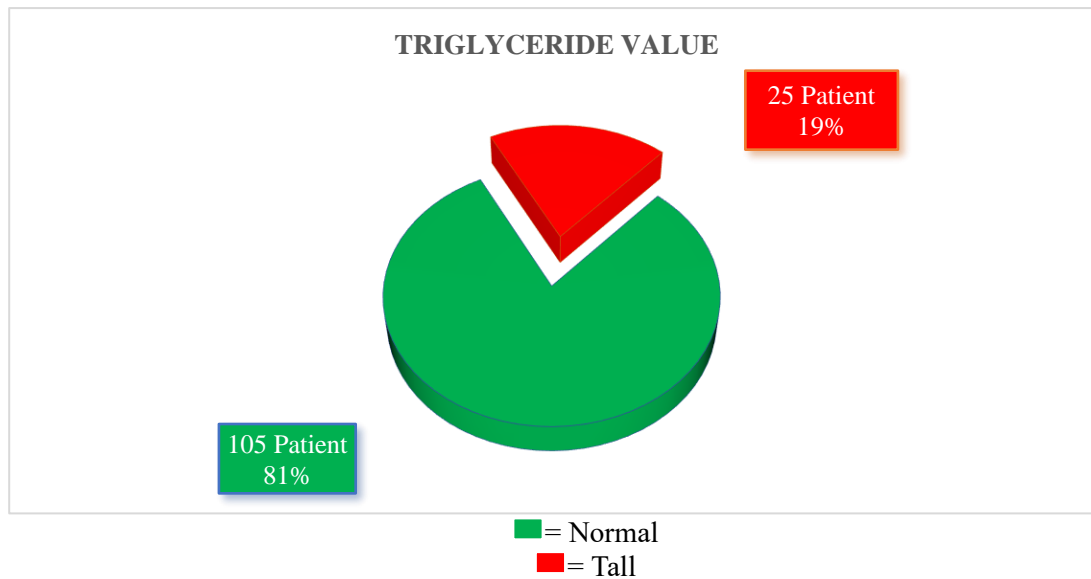
Based on the results of the research that has been conducted, the following data on the distribution of Triglyceride values were obtained:

**Table 5.** Description of Triglyceride Levels in Ischemic Stroke Patients

Triglyceride Levels	Frequency (N)	Percentage (%)
Normal (<200 mg/dl)	105	81%
Tall (>200 mg/dl)	25	19%
Total	130	100%

Source: Secondary Data, 2023

Reviewed from Triglycerides, a table can be obtained showing that elevated LDL levels have been found in 19% and the population with normal Triglycerides is 81%.



**Diagram 4.** Distribution of Ischemic Stroke Patients Based on Triglyceride Levels in Patients Treated at Ibnu Sina Hospital Makassar in the Period January-June 2023

## DISCUSSION

The study was conducted at Ibnu Sina Hospital Makassar with the aim of determining the level of lipid profile values in ischemic stroke patients. In this study, based on the research subjects, I as a researcher considered several characteristics of the research objects, namely gender characteristics. From table 1, namely stroke cases based on gender, out of 130 ischemic stroke patients, the most were found in men with each percentage of high lipid profile levels except for women who showed high triglyceride levels compared to men. total cholesterol levels of (95%), LDL of (73%), HDL of (53%), and triglycerides of (48%).

The theory also states that premenopausal women have a lower risk than men. After menopause, the protective factor in women disappears, and the incidence becomes almost the same as men. The results of this study are in accordance with research conducted by zulfahis et al. regarding Comparison of Blood Lipid Profile Levels at DR. H. Abdoel Moeloek Bandar Lampung showed that the largest number of cases were male, 127 respondents (50.8%) while females were 123 respondents (49.2%) (6). In line with research by Prima I et al. (2022) which showed that stroke had an incidence of 51 people (51.5%) while females were 48 people (48.5%) (7).

The American Heart Association found that strokes are more common in men than women. Men are at higher risk of stroke than women. This may be due to the fact that men smoke more often. Smoking can damage the lining of blood vessels, so smokers have higher levels of fibrinogen in their blood than non-smokers. Increased fibrinogen levels can cause blood vessels to thicken, narrowing and hardening. This can cut off blood flow to the brain and cause stroke. The development of stroke in women is associated with the positive effects of the hormone estrogen, which is a protective factor against stroke, especially non-cardioembolic ischemic stroke. The hormone estrogen not only regulates collagen in the renal tubules, but also reduces the risk of stroke and atherosclerosis (8).

Based on the results of the study, Table 1 shows comparative data on total cholesterol levels in ischemic stroke patients of (58%) compared to normal levels of (42%) from 130 patients with ischemic stroke. Increased total cholesterol levels or hypercholesterolemia plays an important role in the occurrence of ischemic stroke, because increased total cholesterol causes blockage of blood vessels. This is in line with the research of Muhammad Fadlan, et al (2020) showing that ischemic stroke patients with high total cholesterol levels in the high limit of 200-239 showed a percentage of (23.9) where the research I conducted using two categories, namely normal and high values (10). For high cholesterol, high total cholesterol levels in the range of >240 showed a percentage of (26.8%) (11). Increased total cholesterol levels or hypercholesterolemia play an important role in the occurrence of ischemic stroke, because increased total cholesterol results in blockages in the blood vessels. These results are supported by the

research of Prasetyo and Garini (2018), which found that most recurrent ischemic stroke patients were found with K-LDL levels of 60-129 mg/dl with a total of 62 patients (57.9%) (12).

In table 2, the distribution of LDL levels shows that the percentage of ischemic stroke patients with LDL levels is the same (50%). In line with the research of Muhammad Fadlan, et al. (2020) showed that LDL levels in the study were divided into 3 categories of high limits (130-159), high (160-189), and very high >190 showed that the percentage of all showed higher (47.9%) compared to normal (42.2%) (13). In the study of Prasetyo and Garini (2018) that recurrent ischemic stroke patients were mostly found with low K-HDL levels as many as 57 people (53.3%) (14). The atherosclerosis process can be initiated by high K-LDL which can accumulate in the intima of the arteries. Furthermore, LDL will undergo oxidation and be phagocytized by macrophages to form foam cells so that a layer of fat or fatty streak will form (15). K-LDL is the main target in the management of dyslipidaemia. Statins are the first lipid-lowering drugs to be used to lower LDL-C levels and are the most widely used lipid-lowering drugs to date. Statin therapy in patients with a history of ischemic stroke is intended as secondary prevention to reduce the risk of recurrent stroke (16).

Based on Table 3, it shows that the percentage of ischemic stroke patients with low HDL levels is (63%) and normal is (37%). This is in line with the research of Muhammad Fadlan et al., showing that as many as 51 out of 71 ischemic stroke patients experienced a decrease in HDL levels with a percentage of (71.8%) and is also supported by the results of the study by Prasetyo and Garini (2018) that recurrent ischemic stroke patients were mostly found with low K-HDL levels as many as 57 people (53.3%) (17). HDL plays a role in reverse cholesterol transport (RCT), namely returning excess cholesterol in peripheral tissue to the liver for excretion. The distribution of cholesterol from cells in peripheral tissue to HDL is mediated through scavenger receptor class B1 (SR-B1) and by ATP-binding cassette (ABC) transport molecules. K-HDL is transported to hepatocytes through direct or indirect pathways. In the direct pathway, K-HDL is taken directly by hepatocytes through SR-B1 in the liver. While in the indirect pathway, HDL cholesterol ester is transferred to lipoproteins containing apoB, exchanged with TG by cholesteryl ester transfer protein (CETP). Then, cholesterol ester is removed from circulation through endocytosis mediated by LDL receptors (18,19). Low K-HDL levels in patients with a history of ischemic stroke can be caused by insulin resistance in stroke patients accompanied by other diseases, namely diabetes mellitus (DM) and metabolic syndrome. Based on epidemiology, ischemic stroke patients accompanied by DM are 25% - 45%, while 30% - 50% are accompanied by metabolic syndrome. In a state of insulin resistance, hormone sensitive lipase becomes active and increases TG lipolysis in fat tissue. Excessive free fatty acids (FFA) will enter the bloodstream, some of which are carried to the liver as raw materials for TG formation. VLDL produced in metabolic syndrome is very rich in TG called large VLDL. Large VLDL will exchange TG with cholesterol ester from HDL and produce HDL that is poor in cholesterol ester but rich in TG. HDL in this form will be more easily catabolized by the kidneys so that the amount of serum HDL decreases (20-22).

Based on Table 4.4, it shows that the percentage of ischemic stroke patients with Triglyceride levels is (19%) and normal is (81%). This is in accordance with the research of Muhammad Fadlan, et al. (2020) which showed that Triglyceride levels from 71 people showed as much as (18.3%) and also in accordance with the research of Prasetyo and Garini (2018) that recurrent ischemic stroke patients were mostly found with optimal TG levels of 79 people (73.8%) (22,23). High TG levels are often accompanied by low K-HDL levels and high small-dense LDL levels. Therefore, it is estimated that hypertriglyceridemia as a risk of cardiovascular disease is indirectly caused by low K-HDL levels and high small-dense LDL (24).

### **Recommendations for Future Research**

Recommendation suggestion, the need for regular lipid profile examination to prevent stroke. Then it is expected that the hospital can complete the information in the medical records of all patients by listing the patient's diagnosis and laboratory results more clearly. And for more in-depth research, data collection should be carried out over a longer period of time so that the research results are more accurate and the variables are more comprehensive.

### **CONCLUSION**

This study concluded that 70 people (58%) of the total sample experienced an increase in total cholesterol levels and 50 people (42%) were within normal limits. 65 people (50%) of the total sample experienced an increase

in LDL levels and 65 people (50%) were within normal limits. 82 people (63%) of the total sample experienced a decrease in HDL levels and 48 people (37%) were within normal limits. And 105 people (81%) of the total sample experienced an increase in triglyceride levels and 25 people (19%) were within normal limits.

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