How to Cite:
Murad, S. H. (2022). Total lipid profile levels as an indicator of functional outcomes in first-ever acute stroke patients. *International Journal of Health Sciences*, *6*(S3), 5895–5906. https://doi.org/10.53730/ijhs.v6nS3.7293

Total lipid profile levels as an indicator of functional outcomes in first-ever acute stroke patients

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***Abstract*---**A stroke is an abrupt neurological injury caused by alterations in the blood arteries of the brain, resulting in the loss of neurological function. Stroke is the second greatest cause of death in people globally, after ischemic heart disease, and the most prevalent cause of acquired disability. The goal of this study was to determine the levels of lipid profiles in acute stroke patients. From December 2020 until September 2021, the study will be conducted. One hundred males and females' respondents were included from Ibn-Sena and Al-Salam Teaching hospitals at Mosul City in Iraq. The socio-demographic and clinical data, especially the clinical findings at the time of admission were recorded on a standardized data sheet. Clinical examination and a To confirm the diagnosis, a CT scan of the brain was conducted. A blood sample was taken on the day of admission for total lipid profile analysis. To determine the severity of a stroke, the NIHSS was employed. The patients' functional outcomes were followed for up to three months using a modified Rankin Scale, as follows: good functional (0 - 3), poor functional outcomes (4 - 6). Patients with ischemic stroke and those with stroke had differing mean values of serum triglyceride, cholesterol, low-density lipoprotein (LDL), and high-density lipoprotein (HDL) in this study. The current study's statistical analysis revealed that patients with ischemic stroke had higher mean levels of triglyceride, cholesterol, and low-density lipoprotein than those with hemorrhagic stroke (208.93 vs. 186.81), (208.75 vs. 185.31), and (167.82 vs. 154.56), respectively. In ischemic stroke patients, the mean level of serum HDL was found to be lower (41.46 vs. 46.88) than in hemorrhagic stroke patients. They all had a statistically significant link to stroke and its subtypes (P-value 0.05). This study concluded that early detection of dyslipidemia and its control can decrease the severity of first ever stroke and can improve stroke outcomes.

International Journal of Health Sciences ISSN 2550-6978 E-ISSN 2550-696X © 2022.
Manuscript submitted: 9 March 2022, Manuscript revised: 18 April 2022, Accepted for publication: 1 May 2022

***Keywords*---**acute stroke, ischemic stroke, hemorrhagic stroke, nihss, barthel index, MRS, functional outcomes.

Introduction

Noncommunicable illnesses (NCDs) are a not kidding general medical problem around the world, representing 63% of all fatalities, and this number is expected to ascend by 15% somewhere in the range of 2010 and 2020. Persistent infections, otherwise called noncommunicable sicknesses, are long haul diseases brought about by a blend of hereditary, physiological, natural, and social variables. Cardiovascular problems, (for example, coronary failures and strokes) kill 17.9 million individuals every year, trailed by malignant growth (9.3 million), constant respiratory sicknesses (like ongoing obstructive aspiratory infection and asthma) (4.1 million), and diabetes (4.1 million) (1.5 million). Over 80% of all early NCD fatalities are brought about by these four illnesses (Alwan et al., 2010; Setyopranoto et al., 2019).

Cardiovascular and other non-transmittable sicknesses are the world\'s driving reasons for mortality and inability, and they are the essential driver of rising medical services costs, sabotaging the monetary dependability of individuals, families, social orders, and nations. Individuals kick the bucket from CVD at a far higher rate than from some other reason, albeit most CVD passing's can be stayed away from with cautious interventional measures (Frieden et al., 2020). Beginning around 1980, cardiovascular sicknesses (CVD) have been the essential driver of worldwide high mortality, as indicated by the Worldwide Weight of Infection (GBD) recorded research. In 2015, CVD represented about 33% of all passing's around the world. In the interim, in 2015, the two principal parts of CVD, stroke and ischemic coronary illness, represented 85.1 percent of all CVD passing (Tehrani-Banihashemi et al., 2018).

Stroke is the subsequent driving reason for death in grown-ups around the world, after ischemic coronary illness, and it is the most normal reason for obtained incapacity. The weight of NCDs, including stroke, has stayed consistent in major league salary countries throughout the past 10 years, yet the weight in low-and center pay nations has expanded to around half of absolute illness (Setyopranoto et al., 2019). A stroke is an abrupt neurological injury caused by alterations in the blood arteries of the brain, resulting in the loss of neurological function. Blood vessel changes might be intrinsic to the vessel (atherosclerosis, inflammation, arterial dissection, vascular dilatation, weakness, obstruction) or extrinsic (such as when an embolism travels from the heart) (Sommers, 2019). Fast impromptu urbanization, globalization of undesirable ways of life, and populace maturing are driving purposes for these infections. Raised circulatory strain, expanded blood glucose, high blood cholesterol, and heftiness are side effects of tobacco use, hazardous liquor utilization, unfortunate eating regimens, and an absence of active work. Metabolic uneven characters, frequently known as metabolic gamble factors, can add to cardiovascular sickness. This change in pattern can be credited to populace maturing and the ascent in modifiable cardiovascular infection risk factors (World Wellbeing Association, 2018).

Dyslipidemia and hyperglycemia are two metabolic disorders frequently seen in stroke patients. Dyslipidemia, which includes elevated cholesterol and triglyceride levels, is well-known as a key risk factor for stroke. The significance of cholesterol and triglycerides in acute stroke and their role in post stroke recovery has received little attention to date. The few studies that have looked into this link have found a variety of results (Jain et al., 2013). Cholesterol is essential for several bodily activities, including cell preservation and integrity, as well as the creation of steroid hormones and bile acids. However, an abnormally high blood cholesterol level can lead to a variety of issues, including artery narrowing and blockage in various parts of the body, particularly coronary arteries, and oxidative stress, which is caused by an increase in the production of oxygen free radicals caused by changes in the arterial and microvascular circulatory systems.

As a result, it is widely acknowledged as one of the primary causes of human disease and mortality (Li et al., 2020; Vakilian et al., 2019). Lower levels of TC in patients with acute ischemic stroke are related with severe disease and adverse outcomes, according to some of these articles and study. Nonetheless, there are numerous studies that suggest a beneficial effect of lower TC levels on the development and progression of cardiovascular and cerebrovascular illnesses (Pikija et al., 2019). Surprisingly, a simple linear association between TC, LDL-C, and stroke has yielded inconsistent evidence from multiple investigations. Lower levels of TC in patients with acute ischemic stroke are related with severe disease and adverse outcomes, according to some of these articles and study. Nonetheless, there are numerous studies that suggest a beneficial effect of lower TC levels on the development and progression of cardiovascular and cerebrovascular illnesses (Pikija et al., 2019). It's crucial to assess the differences in blood lipid levels among stroke subtypes in order to advise cholesterol-lowering medication, which can minimize stroke incidence and related death by adjusting primary and secondary preventative approaches (Wali & Patil, 2016).

The current guideline's strong advice to regulate total cholesterol (TC) and low-density cholesterol (LDL-C) levels reduces the risk of atherosclerosis and stroke (Mankovsky & Ziegler, 2004; Nayor & Vasan, 2016). Guidelines for managing hyperlipidemia with the 3-hydroxy-3-methylglutaryl coenzyme In the treatment and prevention of acute ischemic stroke (AIS), reduced vascular events in patients with past ischemic stroke (IS), and reduced IS in patients with other vascular disorders, reductase inhibitors (statins) are particularly essential (Markaki et al., 2014). Low density lipoprotein cholesterol (LDL-C) causes increased cholesterol deposition in the artery wall, while low triglyceride (TG) levels induce atherosclerosis, according to popular belief (Lawler et al., 2020). Hyperglycemia is another risk linked to stroke admission, with 20–50% of acute stroke patients having a concurrent diagnosis of hyperglycemia (blood glucose level >6.1mmol/L or 121 mg/dL), which could be transitory or actually reflective of undiagnosed impaired glucose metabolism. The severity of acute stroke is linked to the incidence and severity of hyperglycemia, and hyperglycemic patients have a higher fatality rate (Ali et al., 2019; El-Fawal et al., 2019).

The mechanism varies with the patients' underlying glucose tolerance, kind and severity of disease, and stage of illness, and is independent of other predictors of a poor prognosis such as age, diabetic status, and stroke severity (El-Fawal et al., 2019; Kumar et al., 2020; Ogbera et al., 2014). Hyperglycemia's direct toxicity on the brain and acidosis, which appears to be a potential neurotoxic impact of anaerobic cerebral glucose metabolism, are two possible scenarios. Clinical therapy for stroke patients with diabetes would most likely change not only in terms of blood pressure and lipid management, but also in terms of the feasibility of institutional insulin administration. The GIST-UK (Glucose-Insulin Stroke Trial-UK) found no differences in clinical outcomes between acute stroke patients who received intravenous insulin, potassium, and glucose versus those who received saline. In another study, aggressive blood glucose lowering with insulin was linked to poor outcomes (Wada et al., 2018). Without a doubt, dyslipidemia and diabetes are two of the most frequent conditions in the world, and they are risk factors for a variety of diseases. Furthermore, there is a strong link between triglyceride levels and insulin resistance (Weir et al., 2003). The aim of this study was to evaluate lipid profile levels after acute stroke patients in Mosul city

Materials and Methods

Administrative Arrangements

Before the beginning of conducting the study, the researcher obtained official approval consent permission through introduced the study proposal to the scientific and ethical committee of higher studies in Nursing College / University of Mosul to get the permission of the subject that is appropriateness to scientific research plan. Next step was to get accomplishment agreement from the Department of Training Center & Human Development / Nineveh Health Directorate, in order to access and collect data from patients' admission to the medical-words in Ibn – Sena, and AL-Salam Teaching Hospitals at Mosul City. Field supervisor and patient or caregiver consent written form was adopted to collect and implement the tools of the study.

Setting of study

The present study was carried out in medical-words in Ibn – Sena, and Al - Salam Teaching Hospitals at Mosul City which located in left bank of Tigris River of Mosul City which far, 400 km north of capital Baghdad. A total of (100) patient's (males and females), who admitted to the medical-words and the patient were chosen for the study according to the following inclusions criteria: Patient admitted to emergency department and diagnosed as a sudden neurological deficit (stroke case) lasting for more than (24) hr., Patient who diagnosed as the first event stroke, Non-pregnant woman, Patients who had been diagnosed as stroke by computed tomography (CT) scan, and magnetic resonance imaging (MRI), Adult patients above 18 years old.

Data collection and methods

For the establishment and completing the study requirement; the researcher assigned a time period for data collection and patient follow-up started from 6th of January 2021 until 26th of August 2021. Data were collected through selecting the subject sample (participant) after admission to emergency department and diagnosed as stroke patient and confirmed by the (CT scan), by reviewing the client health history and physical examination to exclude other cases according to the criteria which the researcher follow it.

Data analysis

Measurable investigation, data information was placed into the factual bundle by \"SPSS\" form 26 and Succeed 365 program. To inspect the distinctions, a one-way ANOVA was utilized, with a P worth of 0.05 or less thought to be critical.

The Results

The study comprised of 100 diagnosed cases of clinically and CT/MRI proven acute stroke patients. Their mean age was 59.71 ± 14.018 with the highest rate (56%) of age-specific incidence of acute stroke between 50-69 years of age, (55%) were males and (45%) were females. There were (84%) incidents of ischemic stroke and (16%) incidents of hemorrhage. General characteristics of study respondents are reported in (Table 1).

Table 1
The mean (SD), frequency and correlation of lipid profile with stroke types on admission day

Lipid Profile		Ischemic		Hemorrhagic		Chi-Square Tests	Mean ± SD
		Mean ± SD	%	Mean ± SD	%		
Cholesterol	Desirable	208.93 ± 38.23	42%	186.81 ± 52.34	10%	X^2 = 4.710, DF = 2, P-Value = 0.042*	1.67 ± 0.842
	Borderline		22%		2%		
	High		20%		4%		
Triglycerides	Desirable	208.75 ± 38.15	6%	185.31 ± 52.42	5%	X^2 = 9.407, DF = 2, P-Value = 0.009**	2.38 ± 0.678
	Borderline		33%		7%		
	High		45%		4%		
LDL	Desirable	167.82 ± 16.30	18%	154.56 ± 24.14	9%	X^2 = 10.696, DF = 2, P-Value = 0.005**	2.61 ± 0.567
	Borderline		56%		5%		
	High		10%		2%		
HDL	Desirable	41.46 ± 7.30	2%	46.88 ± 11.00	2%	X^2 = 8.803, DF = 2, P-Value = 0.012*	1.85 ± 0.609
	Borderline		22%		9%		
	High		60%		5%		

LDL: low density lipoprotein.
HDL: high density lipoprotein.

In ischemic stroke patients, the mean value for blood TC, TG, and LDL was found to be high, whereas the mean value for serum HDL was found to be lower (Table 1 & Figure 1), and the difference was statistically significant.

Table 2
The incidence of Lipid Profile in related to the stroke severity assessed by (NIHSS) at time of admission

Lipid Profile		Minor stroke	Moderate stroke	Moderate / severe stroke	Severe stroke	Chi-Square & P-Value
Cholesterol	Desirable	2.0%	38.0%	10.0%	7.0%	X^2 = 19.674, DF = 6, P-Value = 0.003**
	Borderline	0.0%	11.0%	0.0%	8.0%	
	High	0.0%	7.0%	7.0%	10.0%	
Triglycerides	Desirable	1.0%	10.0%	0.0%	0.0%	X^2 = 20.042, DF = 6, P-Value = 0.003**
	Borderline	1.0%	27.0%	5.0%	7.0%	
	High	0.0%	19.0%	12.0%	18.0%	
LDL	Desirable	1.0%	23.0%	3.0%	0.0%	X^2 = 35.433, DF = 6, P-Value = 0.000**
	Borderline	1.0%	33.0%	12.0%	15.0%	
	High	0.0%	0.0%	2.0%	10.0%	
HDL	Desirable	1.0%	3.0%	0.0%	0.0%	X^2 = 14.882, DF = 6, P-Value = 0.021*
	Borderline	0.0%	20.0%	5.0%	6.0%	
	High	1.0%	33.0%	12.0%	19.0%	

Note: x2: chi-square; DF: degree of freedom; %: percentage.
LDL: low density lipoprotein.
HDL: high density lipoprotein.
(*) Represent significant change (p<0.05).
(**) Represent highly significant change (p<0.01).

The connection between levels of different lipids and stroke seriousness at confirmation as evaluated by (NIHSS). The table showed an exceptionally critical relationship between the seriousness of stroke and lipids esteems that deliberate at season of affirmation (P-value<0.05).

Table 3
Relationship between lipid profile with functional outcomes in acute stroke patient assessed by (mRS) after 3 months

Lipid Profile		Good Outcomes	Poor Outcomes	Chi-Square & P-Value
Cholesterol	Desirable	42.0%	15.0%	X^2 = 14.230, DF = 2, P-Value = 0.001**
	Borderline	10.0%	9.0%	
	High	7.0%	17.0%	
Triglycerides	Desirable	10.0%	1.0%	X^2 = 11.910, DF = 2, P-Value = 0.003**
	Borderline	28.0%	12.0%	
	High	21.0%	28.0%	
LDL	Desirable	23.0%	4.0%	X^2 = 24.921,

	Borderline	36.0%	25.0%	DF = 2, P-Value = 0.000**
	High	0.0%	12.0%	
HDL	Desirable	4.0%	0.0%	X^2 = 3.883, DF = 2, P-Value = 0.142
	Borderline	20.0%	11.0%	
	High	35.0%	30.0%	

Note: x^2: chi-square; DF: degree of freedom; %: percentage.
LDL: low density lipoprotein.
HDL: high density lipoprotein.
(*) Represent significant change (p<0.05).
(**) Represent highly significant change (p<0.01).

Many blood lipid markers, including TC, TG, LDL, and HDL, have been utilized to determine the risk of stroke outcomes after 90 days using (mRS). With the exception of HDL (P-value>0.05), all of the measures indicated a highly significant (P-value0.05) connection with stroke outcome.

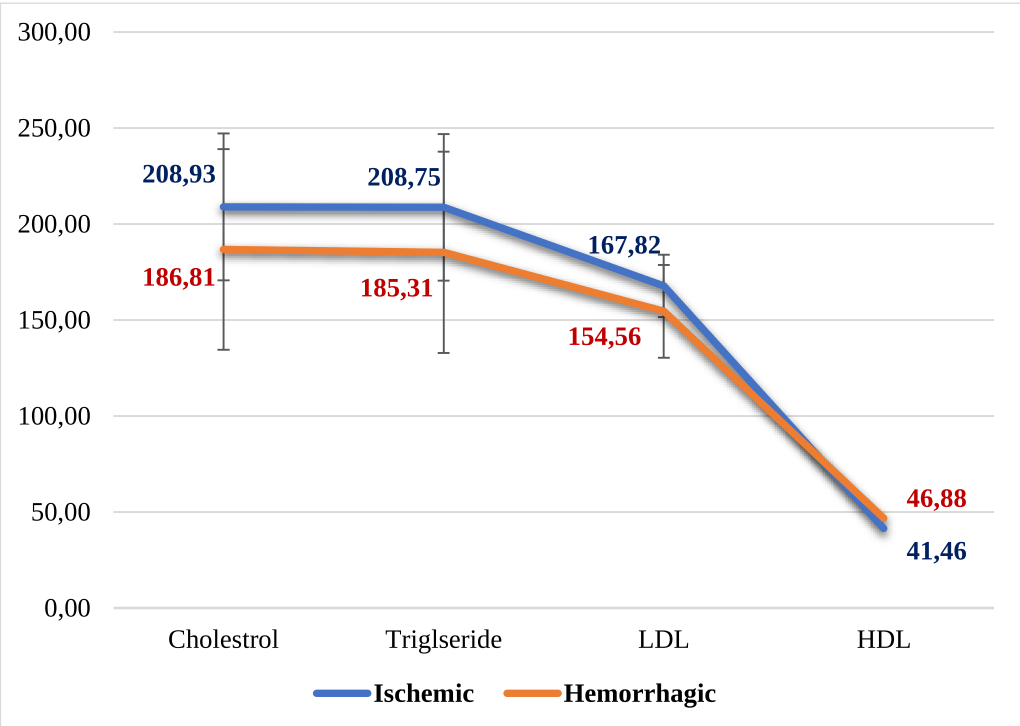

Figure 1. Mean and Standard Deviation of lipid profiles in different types of stroke

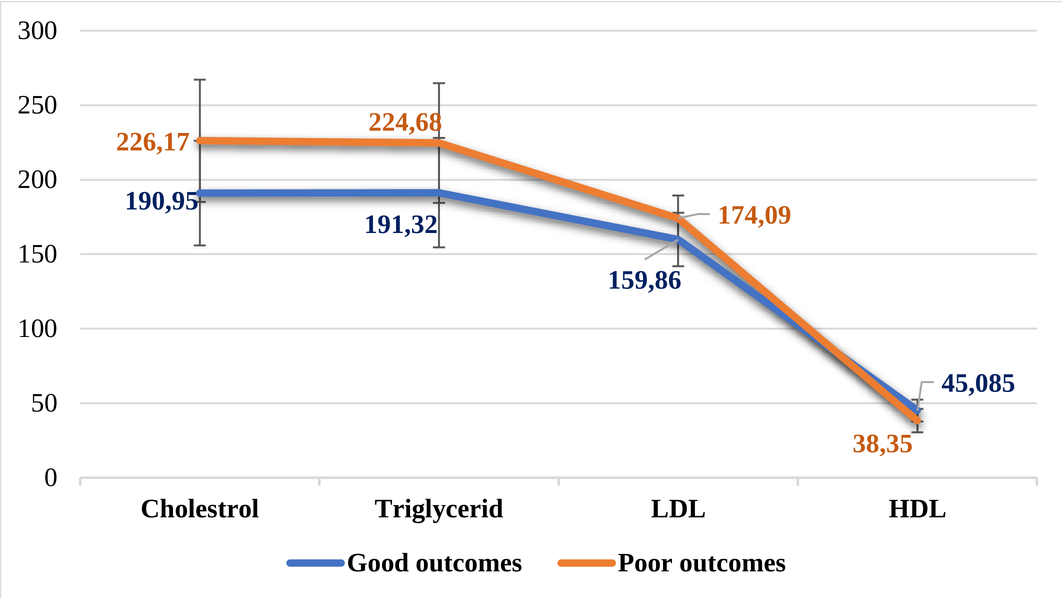

Figure 2. Mean and Standard Deviation of lipid profiles with functional outcomes after 3 months follow-up by using mRS

Discussion

A few exploration examining the connection between atherosclerosis, coronary course sickness, fringe vascular infection, and serum lipids have found that dyslipidemia is a critical gamble factor for cardiovascular diseases, as well as its connect to the occurrence of unexpected stroke (Kostis, 2007). Dyslipidemia is a gamble factor for stroke since it thickens atherosclerotic plaque and the CIMT (Demarin et al., 2010; Vigili de Kreutzenberg et al., 2009). The researcher aims to link various lipid profile markers such as TG, TC, LDL, and HDL to the risk of stroke, severity, and outcome/prognosis of cerebrovascular illnesses in this study. The mean levels of serum triglyceride, cholesterol, low-density lipoprotein, and high-density lipoprotein were found to differ between people who had an ischemic stroke and those who had a hemorrhagic stroke in this study. The current study's statistical analysis revealed that patients with ischemic stroke had higher mean levels of triglyceride, cholesterol, and low-density lipoprotein than those with haemorrhagic stroke (208.93 vs. 186.81), (208.75 vs. 185.31), and (167.82 vs. 154.56), respectively. In ischemic stroke patients, the mean level of serum HDL was found to be lower (41.46 vs. 46.88) than in hemorrhagic stroke patients. As demonstrated in Table 1, they all had a significant relationship with stroke and its subtypes (P-value0.05) (Table 1, & Figure 1).

These discoveries matched those of an Indian review, which observed that the extent of patients with ischemic stroke who had lipid anomalies was considerably higher than that of patients with haemorrhagic stroke who had lipid irregularities (Sreedhar et al., 2010). Furthermore, several similar studies from Iran show that dyslipidemia is associated with stroke subtypes and is the leading risk factor for stroke, as well as being utilized clinically as a stroke predictor (Assarzadegan et al., 2015; Sadeghi et al., 2017; Sarrafzadegan et al., 2012). The lipid markers TC, TC, LDL, and HDL have all been linked to stroke outcomes (Ayaskanta Kar & Malati Murmu, 2018).

The causal association between serum cholesterol and stroke is shaky at best. High total serum cholesterol levels were linked to fewer severe strokes and decreased post-stroke mortality in the Copenhagen stroke research (Olsen et al., 2008). High total cholesterol levels were linked to improved functional outcomes in another investigation (Pan et al., 2010). The current study, on the other hand, found a link between dyslipidemia and stroke severity (NIHSS) at admission and stroke outcome (mRS) after 90 days. As shown in ($p = 0.025$, $p = 0.005$), the higher the levels, the more serious the stroke and the worse the prognosis. These findings were backed up by (Sohail et al., 2013), who found that high triglycerides and LDL were linked to high admission mRS scores, indicating serious strokes. Low HDL levels have been linked to more severe strokes and poorer outcomes in the general population. Increased levels of non-fasting triglycerides were linked to an increased risk of ischemic stroke in a Danish study (Varbo et al., 2011). Endothelial dysfunction, atherosclerosis, and the formation of a prothrombotic condition are all linked to hypertriglyceridemia, which increases the risk of ischemic stroke (Antonios et al., 2008).

Conclusions

Early detection of dyslipidemia and its control can decrease the severity of first ever stroke and can improve stroke outcomes.

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