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Original Research

Investigating the Relationship between Lipid Profiles of Stroke Patients at the Time of Admission and Their Outcome

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Abstract

Hyperlipidemia is one of the critical risk factors for cerebrovascular disease. Many studies have emphasized that controlling the lipid level can decrease the risk of cardiovascular and cerebrovascular events. In this article, we studied all types of lipids in stroke patients and wanted to consider any relation between lipid level in admission and outcome. This retrospective, cross-sectional study was conducted at Imam Reza Research and Training Hospital. It was performed on a sample of 2165 patients who visited the emergency department and were admitted with a diagnosis of acute stroke (ischemic, hemorrhagic, subarachnoid hemorrhage) from 20th 2020 up to 20th 2023. Patients with underlying neoplastic disease, trauma, or coagulation disorders, who visited the emergency department with non-stroke signs and symptoms, and also who had incomplete documents were excluded from the study. The data of this study was extracted from the Tabriz stroke registry. In this study, 2165 patients were included. There is a significant relationship between age and other

variables with most outcomes, but it does not show a strong relationship. There is a substantial relationship between the modified Rankin Scale and other variables with most outcomes, but it does not show a strong relationship. Between the follow-up modified Rankin Scale and other variables, there is a significant relationship with most of the outcomes, but it does not show a strong relationship. With most outcomes, there is a substantial relationship between the outcome and other variables, but it does not show a strong relationship. The initial lipid profile of patients at the time of entering the emergency department did not show a significant relationship with the outcome and length of the patient's hospitalization of none of ischemic and hemorrhagic strokes. None of the candidate patients had received thrombolytic therapy.

Keywords
Stroke; lipid profile; outcome

1. Introduction

Stroke, cerebrovascular accident (CVA), is one of the most common causes of mortality and morbidity all around the world [1]. Not only because of its high death rate but also because it requires long-term care and rehabilitation, stroke places a heavy burden on patients, caregivers, and society [2, 3]. A stroke occurs when a rupture or blockage of a brain artery cuts off the blood flow to the brain; it causes the interruption of nutrients and oxygen supply and, ultimately, damage and death of brain tissue [1].

Hypertension, diabetes mellitus, obesity, lifestyle habits like alcoholism and smoking, hyperlipidemia, atherosclerosis, and atrial fibrillation are considered stroke's modifiable risk factors. On the other hand, non-modifiable risk factors for stroke include race, age, gender, ethnicity, heredity, and stroke history [1, 4]. WHO has proposed some strategies for preventing stroke that include targeting the stroke's controllable factors: hypertension, hyperlipidemia, diabetes, and lifestyle [5].

Hyperlipidemia is a pervasive and dangerous risk factor of cerebrovascular disease [6]. Many studies have shown that reducing cholesterol by using statins in cerebrovascular and cardiovascular diseases significantly affects the decline of stroke risk [7].

In this article, we studied all types of lipids in stroke patients and wanted to consider whether dyslipidemia significantly affects stroke.

2. Material and Method

This retrospective, cross-sectional study was carried out at Imam reza research and training hospital. It was conducted on a sample of 2165 patients who visited the emergency department (ED) and were admitted with a diagnosis of acute stroke (ischemic, hemorrhagic, SAH) from 20th 2022 up to 20th 2023. Patients with underlying neoplastic disease, trauma, or coagulation disorders, who visited the ER with non-stroke signs and symptoms, and also who had incomplete documents were excluded from the study.

The data of this study was extracted from the Tabriz stroke registry, which gather all data of stroke patients in East Azarbaijan Province with all detail [8].

For all the studied patients, the information needed for the research, such as age, sex, length of stay in the hospital, initiation or non-initiation of thrombolytic therapy, history of hyperlipidemia, and patient outcomes such as discharge, permanent neurological deficit or death was recorded.

The data, including age, sex, type of stroke, and risk factors, were statistically analyzed using SPSS version 21 statistical analysis software, and first, it was checked for normal distribution. Due to the non-observance of normal distribution, 25% to 75% prevalence was reported, and the median was declared. Linear regression statistical method was used to check the relationship between the data.

National ethical regulations in medical research, including obtaining permission from the university of the place of study to enter the research environment, introducing oneself to the officials of the research environment as well as to the participants in the research, explaining the purpose of the study to the participants in the research, maintaining the independence of the participants were followed. In the study, by assuring them that they were free in the company, they did not participate and cooperate in the plan.

All the information and data of the patients have been used only regarding the mentioned research, and the respect of all the people in the research group has been maintained.

Lipid abnormalities were defined as Hypercholesterolemia (TC > 240 mg/dl), Hypertriglyceridemia (TG > 150 mg/dl), high Low-density lipoproteins (LDL-c > 130 mg/dl), low High-density lipoproteins (HDL-c < 35 mg/dl).

We used the modified Rankin Scale (mRS) to asses the outcome of stroke at the time of discharge of patients from the hospital and also their short-term outcome during follow-up. mRS score patient's disability in 6 points; 0 is added for the asymptomatic patient and 6 for the expired patient, and the rest of the grades are between these two, respectively**.**

3. Results

In this study, 2165 patients were included, which does not follow the normal distribution (pv < 0.001). The median age of the patients was 69 years (56-78 years). 1125 patients (52%) were male and 1040 (48%) were female.

In the study of stroke types, 1823 patients (84%) were of ischemic stroke type, and other cases included 16%, and the lowest amount was 10 patients who had simultaneous ICH and SAH.

In these 3 months, 2 patients were candidates for thrombolytic therapy, one patient was not given an injection due to uncontrolled blood pressure, and the other was because of dissatisfaction with the patient's guardian, and the patient's lipid profiles weren't documented, so they were excluded from the study (N = 0).

3.1 Lipid Profile of Patients

During hospitalization, mean cholesterol levels of patients were 154 mg/dL (129-186 mg/dL), while mean triglyceride levels were 111 mg/dL (82-149 mg/dL) (Figure 1). Mean levels of LDL were reported as 93 mg/dL (70-119 mg/dL), and mean levels of HDL were 36 mg/dL (30-44.5 mg/dL) (Figure 2, Figure 3).

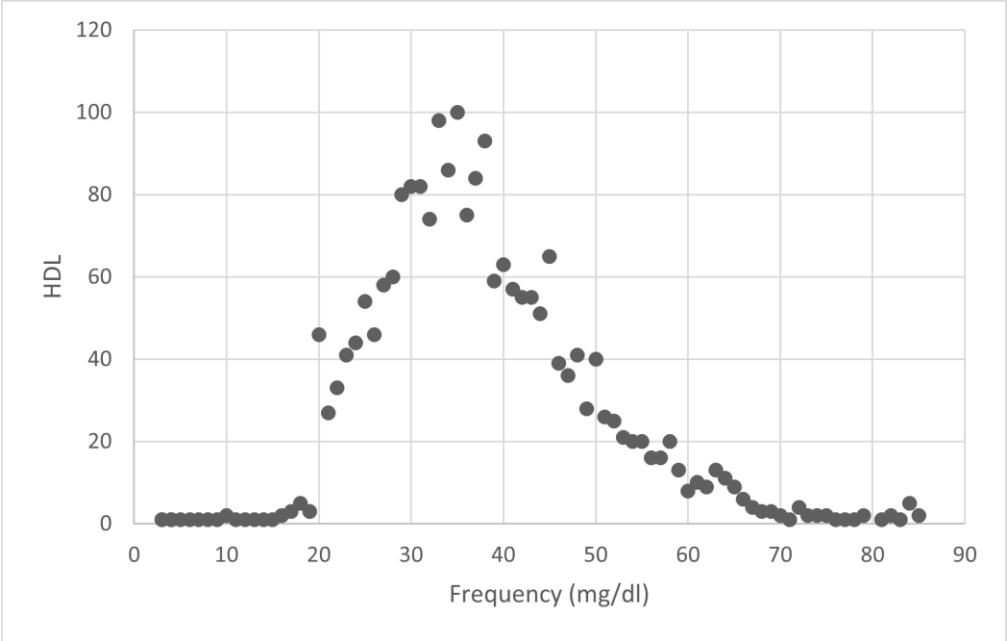

Figure 1 Distribution of Tg level in patients (patient number/Tg level).

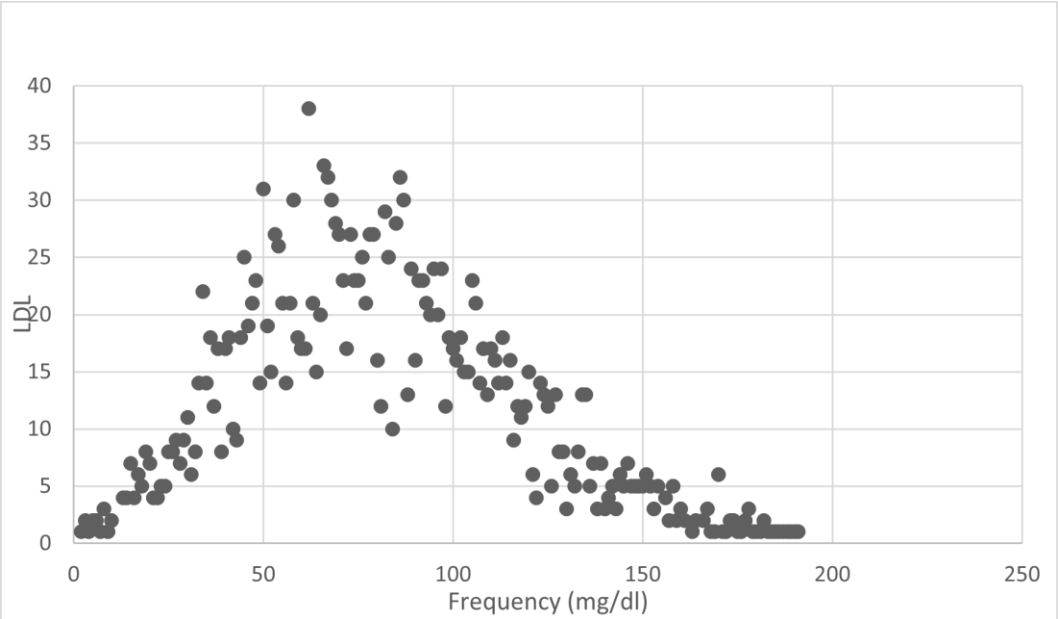

Figure 2 Distribution of LDL level in patients (patient number/LDL level).

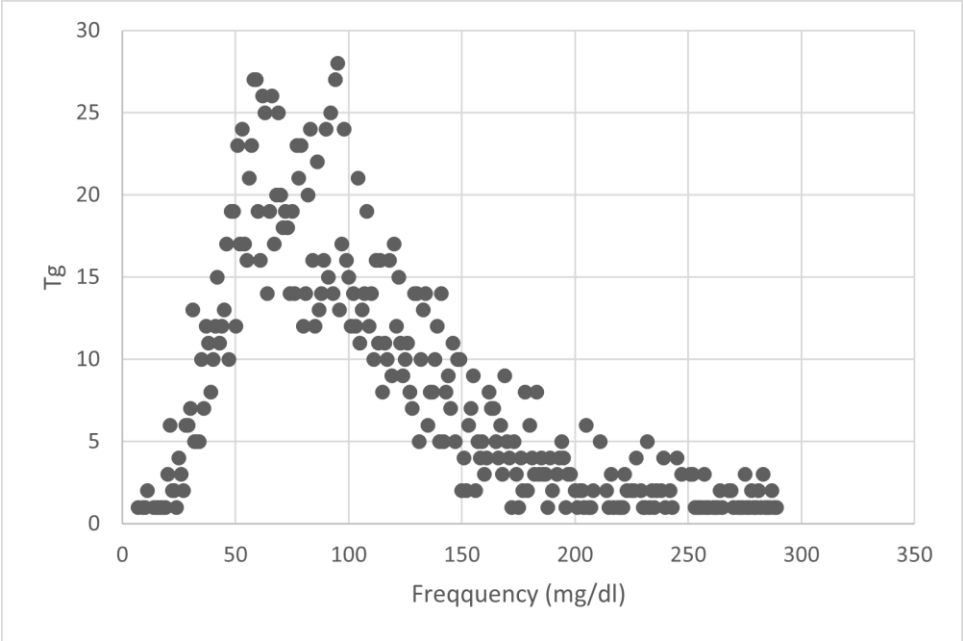

Figure 3 Distribution of HDL level in patients (patient number/HDL level).

The severity of stroke and disability caused by it is assessed by a modified Rankin scale (mRS).

317 patients (14.6%) were discharged with complete recovery without any neurological deficit, and 366 patients (16.9%) died during hospitalization. However, in the assessment of the patients discharged from the neurology ward, 1551 patients (71.6%) were discharged from the hospital by the relevant doctor, 212 patients (9.8%) left the hospital against physician advice, and 36 patients (1.7%) were conducted to other words because of other coexistence disease.

In the mRS examination of the patients in the 3-month follow-up, 307 patients (14.2%) were not available, out of 1858 patients who were followed up, 378 patients (17.5%) were fully recovered, which indicated the improving process after discharge. 368 patients (17%) have died, which means the death of 2 patients in 3 months after discharge. The rest of the patients (1112 patients) had neurological deficits and continued the rehibition process.

There is a significant relationship between gender, age, discharge mRS, and follow-up mRS with lipid profile, but it does not show a strong relationship. Also, there is a significant relationship between the outcome and lipid profile, but it also does not show a strong relationship (Table 1).

Table 1 Relationship assessment between lipid profile and patients' demography and mRS.

	TC		TG		LDL		HDL	
	Correlation coefficient*	PV	Correlation coefficient*	PV	Correlation coefficient*	PV	Correlation coefficient*	PV
sex	0.15	<0.001	0.11	<0.001	0.11	<0.001	0.14	<0.001
age	-0.13	<0.001	-0.22	<0.001	-0.07	0.001	-0.04	0.083
Discharge mRS	-0.09	<0.001	-0.14	<0.001	-0.07	0.002	-0.02	0.263
Follow-up mRS	-0.09	<0.001	-0.16	<0.001	-0.06	0.012	-0.02	0.401
outcome	-0.06	0.002	-0.06	0.003	-0.06	0.004	-0.01	0.519
Stroke type	0.13	<0.001	0.49	<0.001	0.04	0.107	0.03	0.181

Lower than 0.3 is low, between 0.3 and 0.8 moderate, and higher than 0.8 vigorous.

There is a significant relationship between the type of stroke and lipid profiles. This relationship has a relatively good relationship with triglycerides, and with the increase of triglycerides, the probability of ischemic stroke increases (Table 1).

Due to the absence of patients with thrombolytic injections, it was impossible to investigate the relationship of the mentioned variables in these patients, and all the studied patients were patients who did not receive thrombolytic injections. Therefore, the number of patients receiving thrombolytics was zero (N = 0).

4. Discussion

According to the study conducted on 15600 patients in Tehran between January 2020 and January 2023, we considered the average level of Iranian's lipid profile as follows: TG = 183.39 ± 89.51 mg/dL, TC = 189.25 ± 38.96 mg/dL, HDL-c = 48.87 and LDL-c = 86.64 mg/dL [9]. Compared to the result of the Tehran study, average amounts of all parameters of the lipid panel except LDL were lower. Our study showed an increase in LDL-c levels and a decrease in HDL-c levels in stroke patients. There weren't any significant changes in TC and TG levels among our stroke patients. The present study showed that mean LDL-c levels were significantly higher in stroke patients, which contradicts the findings of Ethiopia [10] and Karachi, Pakistan [11]. Still, it is aligned with a study conducted in Nigeria [12]. This may be due to their consequences for the pathogenesis of atherosclerosis [13], and stroke is also associated with changes in lipid levels due to stress and catecholamine overproduction that occurs during an acute stroke, which may explain the difference in the results of the studies [11].

In our study, serum HDL-c level was significantly lower in stroke patients. This finding is consistent with previous studies in India [10, 14]. Contrary to our findings, studies conducted in India [15, 16] and Iraq [11] reported no significant difference in serum HDL-c levels between stroke patients and control subjects. The inverse relationship between HDL-c and stroke can be explained by the capacity of HDL-c to transport cholesterol from peripheral cells to the liver and prevent lipid peroxidation [17], although this relationship is weak.

Our Results revealed that dyslipidemia was not evident at the time of stroke in patients, and it did not show any special relationship with the outcome of patients.

According to our results, the prevalence of stroke in men is relatively higher than in women, which is in contrast with previous studies in Iran [18, 19] but in line with studies in Germany and Turkey [3, 20]. Also, our findings showed that the mean age for stroke was 69 years. In the Netherlands, the mean age of stroke was reported to be 66.8 years [21], while in studies conducted in Iran by Iranmanesh et al. and Vakilian et al., the mean ages of stroke in men were 64.25 and 62.5, respectively, and in women was 70.32 and 72.5 respectively [18, 19]. Also, in a study in Turkey, the mean age of stroke was 61.4 years [3]. These reports are consistent with our results.

Furthermore, ischemic stroke was the most common type of stroke with a prevalence of 84%, according to our findings, which is in line with research carried out in Iran, Turkey, and a mean of 32 countries around the world with an IS prevalence of 76.1%, 88.1% and 77.3% respectively [3, 18, 22].

In the present paper, our data demonstrates that 14.6% of the patients were cured entirely (mRS = 0), 16.9% of them died during hospitalization (mRs = 6), and in 3 months follow-up, 17.5% of them had no symptoms (mRS = 0), and 17% had died that his in contrast with research in Kansas, in which

mRS = 0 at the time of discharge reported 1.9% and after 3 months 0.4% of patients had no symptoms and 3.9% were not alive [23].

Even though the variables discussed in this research have a significant statistical relationship, there is no clinical significance. On the other hand, we must increase population knowledge about risk factors and the golden time of presentation in emergency departments to decrease the incidence rate [24, 25].

5. Limitation

A larger sample size could make it easier to generalize the findings.

6. Conclusions

The results of the present study show that:

The initial lipid profile of patients at the time of entering the emergency department did not show a significant relationship with the outcome and length of patient's hospitalization of none of ischemic and hemorrhagic strokes. None of the candidate patients had received thrombolytic therapy.

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Author Contributions

Study design: Samad Shams Vahdati. Supervision: Alireza Ala. Data Gathering: Sara Rostamnezhad. Scientific consult: Elyar Sadeghi-Hokmabad. Writing: Mohadeseh Rajabpour. Critic: Hasan Amiri. Analaysis: Samad Shams Vahdati.

Competing Interests

The authors have declared that no competing interests exist.

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