

Original Research Article

LDL levels and ejection fraction in ischemic stroke patients: a hospital based cross-sectional study

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ABSTRACT

Background: Ischemic stroke is a top contributor to mortality amongst non-infectious diseases. Atherosclerosis is a major risk factor. This study aims to assess LDL levels and ejection fraction in ischemic stroke patients.

Methods: This descriptive cross-sectional study was conducted in Government Thoothukudi Medical College from November, 2022 to April, 2023. 35 patients admitted in the neuromedicine ward and diagnosed as acute ischemic stroke were included in the study after informed consent and ethical clearance. Patients with acute neurological deficit and evidence of infarct on diffusion-weighted MRI were included. Patients with no evidence of infarct on DWI, those already on lipid lowering therapy, patients with a history of cerebrovascular disease or transient ischemic attacks were excluded. Blood for lipid profile taken after 8 hours of overnight fasting. Echocardiography done for all patients.

Results: Of the 35 patients, 26 (74.28%) were men, mean age was 62.4. 57.14% ischemic stroke patients had their LDL levels elevated, 28.57% had decreased HDL, 28.57% had total cholesterol levels elevated, and in 14.28% triglycerides was elevated. This study also observed the cardiac status of the patients which showed 29% patients had decreased ejection fraction.

Conclusions: This study concluded that most patients had elevated LDL levels which is an independent risk factor of ischemic cerebrovascular disease. LDL levels were also associated with decreased ejection fraction in a significant number of patients. Thereby it can be concluded that elevated LDL cholesterol levels can add to the cardiac risk, potentially contributing to stroke morbidity and mortality.

Keywords: Ejection fraction, Ischemic stroke, LDL levels

INTRODUCTION

Stroke is a major contributor to mortality and morbidity.¹ Stroke is divided into ischemic stroke (80%) and hemorrhagic stroke (20%). Ischemic stroke, the major subtype leading to neurological dysfunction, is caused by cerebral vascular compromise.² Atherosclerosis afflicts multiple vascular territories, causing nearly all of coronary artery disease and some proportion of ischemic strokes. Although the role of cholesterol subfractions in coronary artery disease is well documented, it is still

unclear whether lipid profile plays a significant role in the etiopathogenesis of ischemic stroke. Research of this area have yielded inconsistent results. Whereas dyslipidemia is a major risk factor in cardiovascular diseases, it's role in cerebrovascular disease is not very clear.³ Epidemiologic association between cholesterol levels and stroke remains debatable.⁴ There have been divergent viewpoints regarding the importance of circulating cholesterol levels in stroke.

Stroke incidence differs among men and women. Although more men suffer from stroke, women seem to suffer worse outcomes.⁵ In addition, there is inadequate evidence to suggest the causal involvement of HDL-C levels and elevated triglycerides.⁶ In patients with documented coronary artery disease, there is an increased risk of ischemic stroke or transient ischemic attack (TIA) with elevated cholesterol levels.⁷ However in patients with previous history of stroke or TIA, LDL-C was not associated with any type of stroke.⁸

This study aims to assess LDL levels and ejection fraction in ischemic stroke patients. Lipid profile levels were assessed in ischemic stroke patients along with other risk factors and ejection fraction checked for all the patients included.

METHODS

This descriptive cross-sectional study was conducted in Government Thoothukudi Medical College from November, 2022 to April, 2023.

Total 35 patients admitted in the neuromedicine ward and diagnosed as acute ischaemic stroke were included in the study after informed consent. Inclusion and exclusion criteria analysed. Demographic profile including age, sex, medical history, type of stroke, investigations noted. Blood for lipid profile taken after 8 hours of overnight fasting. Echocardiography done for all patients. Mean age calculated. Categorical data represented as percentages.

Inclusion criteria

Patients with age 40-75 years, patients with acute neurological deficits and evidence of infarct on DWI MRI were included.

Exclusion criteria

Patients with already on lipid lowering therapy, history of cerebrovascular disease and history of transient ischemic attack were excluded.

Statistical analysis

Findings described in a descriptive manner. Statistical Analysis was performed with the help of Epi Info (TM) 7.2.2.2 EPI INFO is a trademark of the Centers for Disease Control and Prevention (CDC). Study was conducted after due consideration of all ethical issues.

RESULTS

Of the 35 patients, 26 (74.28%) were men, mean age was 62.4 years. 42.86% patients were diabetic, 37.14% patients were hypertensive (Table 1). 57% ischemic stroke patients had their LDL levels elevated, 28.6% had decreased HDL, 28.6% had total cholesterol elevated, and in 14.3% triglycerides was elevated (Table 2). This study

also observed the cardiac status of the patients which showed 29% patients had decreased ejection fraction.

Table 1: Distribution of the patients.

	Age	62.4 years (%)
Sex	Male	26 (74.28)
	Female	9 (25.72)
Diabetes		15 (42.86)
Hypertension		13 (37.14)

Table 2: Lipid profile abnormalities in ischemic stroke patients.

Lipid profile abnormalities	Number of patients (%)
Total cholesterol >230 mg/dl	10 (28.57)
LDL cholesterol >130 mg/dl	20 (57.14)
HDL cholesterol <40 mg/dl	10 (28.57)
Triglycerides > 200 mg/dl	5 (14.28)

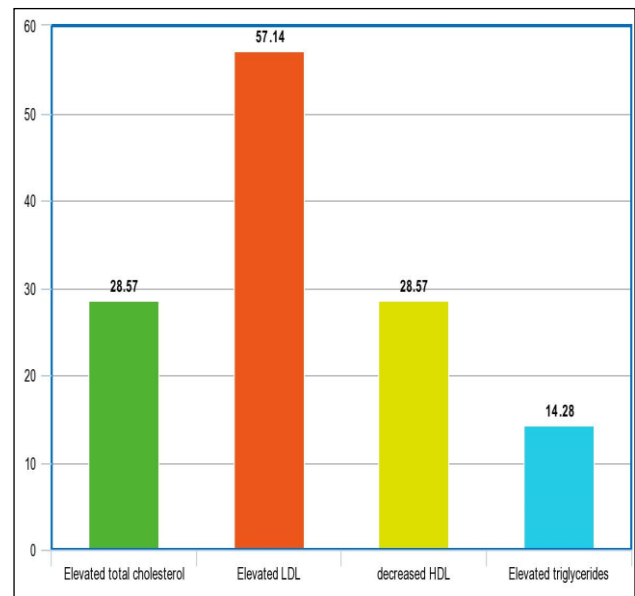


Figure 1: Percentage of lipid profile abnormalities in ischemic stroke patients.

Ejection fraction was found to be less than 40% in 29% cases, all of whom had elevated LDL levels.

DISCUSSION

Some studies show elevated LDL levels correlate with the risk of ischemic stroke.⁹ However, there are studies which show no such link with the risk of ischemic stroke.¹⁰ Studies have provided diverse results with respect to the relationship of LDL, HDL, and triglycerides with ischemic stroke. Mean age of the patients in our study was 62.4 years. Male to female ratio of the ischemic stroke patients enrolled was 2.89:1 which is close to what was seen in the study done by Hassan et al.¹¹ In our study among the risk factors, diabetes was

present in 15 (42.86 %) patients. A study done by Mahmood et al showed 41 % of ischemic stroke patients had diabetes.¹² Thus, diabetes is a major contributor in ischemic stroke. This study also showed 13 (37.14 %) patients had hypertension. Although this is less than that seen in available literature but it is still a major risk factor in ischemic stroke.

In our study LDL levels were increased in 20 (57.14 %) patients. This is in line with current literature.¹³ Total cholesterol was elevated in 10 (28.57%) patients and HDL cholesterol was decreased in 10 out of the 35 patients. Triglycerides were found to be elevated in 14.28% of the patients. This is in line with current studies which have not found a positive correlation between incidence of ischemic stroke and elevated triglyceride levels.¹⁴ Hence it can be concluded that elevated LDL cholesterol is a major risk factor in ischemic stroke.

Stroke is a heterogeneous disease and classifying ischemic stroke as one particular entity may undermine some risk factors.¹⁵ Lacunar strokes, causing occlusion of small perforating arteries, may be associated with diabetes and hypertension whereas embolic stroke could be due to thrombin-rich clots that develop in the heart. Carotid and intracranial artery atherosclerotic disease are other risk factors for ischemic stroke. Atherosclerotic diseases have a more significant association with serum lipid profile levels. Our study has not examined the causal relationship between LDLC and small artery occlusion or cardioembolic stroke. The association between HDLC and ischemic stroke seems to be less clear as compared with LDL cholesterol in our study. The role of HDL cholesterol in strokes has been reported in few previous studies. Higher serum HDL cholesterol levels has previously been found to be related to higher cerebral vasculature CO₂ reactivity. There is also some evidence that low HDL cholesterol levels may affect endothelial function, leading to small vessel strokes.¹⁶ Our study does not support a causal association of triglycerides in ischemic stroke. These results are in line with those from clinical trials that have not been able to establish that lowering triglyceride levels could affect stroke risk. Left ventricular ejection fraction was found to be decreased in 29 % of the patients. A study by Sung et al showed correlation between ejection fraction and severity of neurological dysfunction in ischemic stroke patients.¹⁷ All the patients with low ejection fraction had elevated LDL levels. A study by Mayala et al showed a negative correlation between left ventricular ejection fraction and serum LDL cholesterol levels.¹⁸

The limitation of this study was that it was conducted in a single tertiary care centre. Multi-centre studies with larger sample sizes are needed to be more conclusive.

CONCLUSION

Elevated LDL levels are a major risk factor in ischemic stroke. It can also contribute to ischemic heart disease,

thus adding to the morbidity risk of stroke patients. Our study concludes that further LDL cholesterol reduction is likely to result in risk reduction in ischemic stroke. Our study further suggests that the LDL cholesterol lowering may be of benefit in reducing the risk of coronary artery disease, thereby reducing the risk of embolic strokes. However, elevated triglycerides do not seem to be strongly associated with the risk for ischemic stroke. Thus indicating that future triglyceride-lowering therapies may not have a direct impact on ischemic stroke reduction, however they do provide cardiovascular benefit which could control co-morbidities associated with stroke.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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