

**ORIGINAL RESEARCH**

# Evaluation of Serum Lipid Profile Levels as a Risk Factor for Ischemic Stroke at a Tertiary Care Hospital

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**ABSTRACT**

**Background:** Stroke is the second most prevalent cause of mortality worldwide and a primary contributor to disability, with a rising occurrence in emerging nations. The association between serum lipids and ischemic stroke is still a subject of debate. Research on lipid-related risk factors in cerebrovascular disease has shown inconsistent results and has used different definitions for the cerebrovascular endpoints. So, the current study aimed to evaluate the significance of serum lipid profile as a risk factor in ischemic stroke.

**Materials and Methods:** Present study was conducted in Department of General Medicine, Government Medical College, Kannauj, Uttar Pradesh, India. A cohort of 60 patients diagnosed with ischemic stroke and 60 healthy individuals who attended regular medical examinations were included in the study during July 2023 to December 2023. Comprehensive demographic and clinical information of all the patients was acquired. The stroke diagnosis was verified with a cerebral CT scan. A lipid profile was conducted on the day after admission, following an 8-hour fasting period. Data was examined utilizing the SPSS program.

**Results:** An evident discrepancy was noted when comparing the levels of total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C) between the stroke patients and the control group. Moreover, while analyzing dyslipidemia, it was apparent that the group of patients who had experienced an ischemic stroke had a much higher percentage of individuals with dyslipidemia in comparison to the control group.

**Conclusion:** It is important to consider the lipid profile assessment when calculating the individual risk of stroke.

**Keywords:** Ischemic Stroke, Serum Lipid, TC, HDL, LDL.

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**INTRODUCTION**

Ischaemic stroke is characterized as the occurrence of tissue death (infarction) in the brain, spinal cord, or retina. It accounts for approximately 71% of all strokes worldwide.<sup>1,2</sup> The cause of ischemic stroke is either a thrombotic or embolic event that leads to a reduction in blood flow to the brain. A thrombotic event occurs when there is a blockage of blood flow to the brain within a blood vessel due to problems with the vessel itself, often caused by atherosclerotic disease, arterial dissection, fibromuscular dysplasia, or an inflammatory disorder. The cause of stroke impacts both the predicted course and results.<sup>3,4</sup>

Atherosclerosis is a persistent inflammation that becomes apparent suddenly when a plaque becomes detached, leading to the formation of a blood clot (thrombosis).<sup>5</sup> Atherosclerosis can develop in any arterial segment, particularly in medium and large blood vessels. This process commences from early childhood and persists till the end of one's life. Approximately 96% of those who live until their eighth decade are predicted to have atherosclerosis. It is hypothesized that the development of atherosclerosis in the aorta begins in the first ten years of life, followed by atherosclerosis in the coronary arteries during the second ten years of life,

and in the cerebral arteries during the third ten years of life. Cerebral atherosclerosis develops in males a decade earlier than in females.<sup>6</sup>

Among the various theories explaining the development of atherosclerosis, the most widely accepted one is a mix of the endothelial damage theory and the lipid infiltration theory. This theory posits that atherosclerosis develops through a series of stages, triggered by damage to the endothelium lining of blood vessels caused by many stimuli, including mechanical forces (such as hemodynamic and traumatic events), endotoxins, and low-density lipoprotein (LDL). These factors have the potential to induce alterations in the endothelium membrane. Endothelial injury leads to the activation and adhesion of platelets, as well as increased infiltration of lipids into the blood vessels.<sup>7</sup>

Hyperlipidemia is a significant factor in the development of coronary heart disease, however its connection to stroke is intricate. The level of total cholesterol is linked to the likelihood of experiencing a stroke, while high-density lipoprotein (HDL) reduces the occurrence of strokes. Hence, assessing the lipid profile allows for the estimation of the likelihood of experiencing a stroke. In a particular study, individuals with low levels of HDL cholesterol (<0.90 mmol/L) were found to have high levels of elevated triglyceride levels (>2.30 mmol/L) and high blood pressure were linked to a twofold increase in the risk of mortality caused by stroke in the general population.<sup>8,9</sup> So in present study we decided to evaluate the significance of serum lipid profile as a risk factor in ischemic stroke.

## MATERIALS AND METHODS

Present study was conducted in Department of General Medicine, Government Medical College, Kannauj, Uttar Pradesh (India) to evaluate the significance of serum lipid profile as a risk factor in ischemic stroke. A cohort of 60 patients diagnosed with ischemic stroke and 60 control subjects undergoing regular medical check-ups were included in the study during July 2023 to December 2023. We

acquired comprehensive demographic and clinical information for all patients.

These patients aged between 35-75 years of both genders male and female voluntarily agreed to participate in the research and provided their informed consent were included in the study. The exclusion criteria included individuals with a prior history of stroke and those who were currently using lipid-lowering medications, antiplatelet and anticoagulant drugs, patients with history of arterial fibrillation, CHD and ischemic heart disease patients. The control group consisted of patients who met the criteria of having the same age range and sex as the case group, and who were willing to participate in the study and provide written informed consent. The exclusion criteria encompassed participants with a history of stroke and a familial predisposition to stroke. The control group subjects were paired according to age and gender.

The stroke diagnosis was established by plain CT scan of brain. A lipid profile was conducted on the day after admission, after an 8-hour period of fasting. Normal values for serum total cholesterol are below 200mg/dl, LDL cholesterol below 100 mg/dl, triglycerides below 150mg/dl, and HDL levels above 40 mg/dl. The data was analyzed utilizing the Statistical Package for the Social Sciences (SPSS).

## RESULTS

In the present study we found that the majority of patients were aged between 51 to 55 years in case group 30% and in control group 33.3% followed by patients aged above 56 years case group was 28.3% and control group 26.6%. We found that the majority of patients in both the trial group and control group were males (60%). A statistically significant difference was seen when comparing the levels of total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C) between the stroke patients and the control group. Upon analyzing dyslipidemia, it was observed that the ischemic stroke group had a considerably higher proportion of individuals with dyslipidemia compared to the control group.

**Table 1: Age wise distribution**

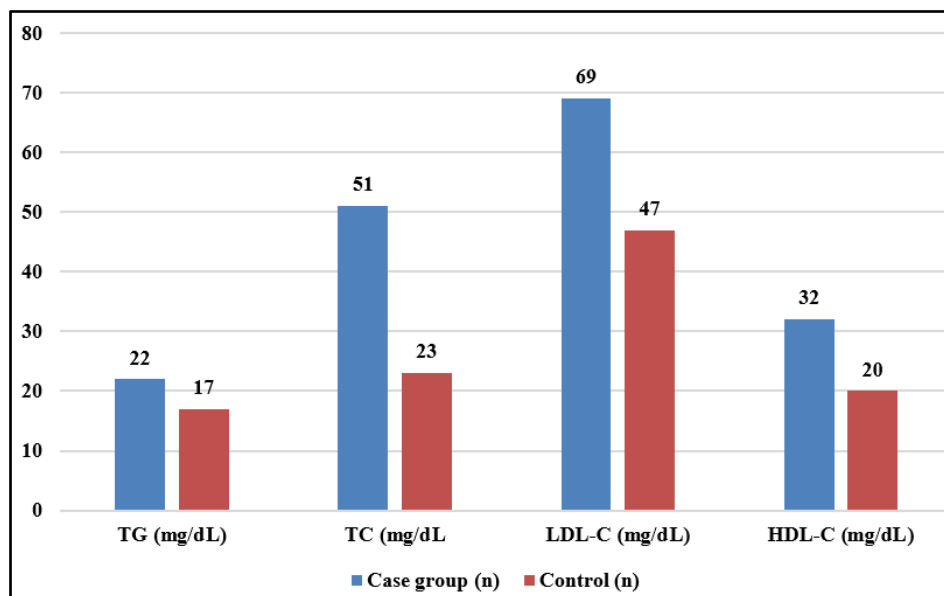
Age	Case (60)	Control (60)
35-45	10 (16.6%)	12 (20%)
46-50	15 (25%)	12 (20%)
51-55	18 (30%)	20 (33.3%)
56-75	17 (28.3%)	16(26.6%)

**Table 2: Correlation between serum lipid profile and ischemic stroke**

Lipid profile	Case group	Control	P value
TG (mg/dL)	123.8	120.1	0.11
TC (mg/dL)	195.6	143.7	0.01*
LDL-C (mg/dL)	121.9	92.7	0.01*
HDL-C (mg/dL)	56.94	39.9	0.01*

**Table 3: Association between deranged lipid levels and ischemic stroke**

Lipid profile	Case group (n)	Control (n)	P value
TG (mg/dL)	22	17	0.11
TC (mg/dL)	51	23	0.01*
LDL-C (mg/dL)	69	47	0.01*
HDL-C (mg/dL)	32	20	0.01*

**Fig 1: Association between deranged lipid levels and ischemic stroke**

## DISCUSSION

Ischemic stroke primarily arises from vascular diseases, such as atherosclerosis, hypertension, and thrombosis.<sup>10</sup> Dyslipidemia is a condition characterized by abnormal amounts of lipids in the bloodstream, which greatly increases the risk of cardiovascular illnesses. Imbalances in lipid levels, caused by either genetic predispositions or lifestyle factors, can result in the development of atherosclerosis and other cardiovascular problems. The severity and progression of carotid atherosclerosis are closely correlated with elevated levels of total cholesterol, LDL cholesterol, and triglycerides, as well as reduced levels of HDL cholesterol.<sup>11</sup>

The predominant symptoms of a stroke that individuals commonly exhibit are facial paresthesia and paresis, visual impairment, hemiparesis affecting the upper or lower extremities on one side of the body, compromised equilibrium, nausea, sudden and intense headache of uncertain etiology, and speech dysfunction. Both men and women commonly experience typical stroke symptoms. However, women are more prone to experiencing nontraditional stroke symptoms such as dizziness and fainting. Fast and accurate diagnosis in stroke is key to good prognosis.

In the present study patients aged above 35 years were included we found that majority of patients were aged between 51 to 55 years. Male dominance was seen in our study. In the present study a notable

disparity was observed when comparing the levels of TC, LDL-C, and HDL-C between the stroke patients and the control group. When analyzing dyslipidemia, it was shown that the ischemic stroke group had a considerably higher proportion of individuals with dyslipidemia compared to the control group. Woo et al. conducted a study on the relationship between lipid profile and ischemic stroke. Ischemic stroke was associated with elevated levels of total cholesterol, LDL, and Apo B.<sup>12</sup>

Examining serum lipid and lipoprotein levels within 48 hours of admission to determine risk factors for cerebral infarction may lead to misidentification of specific lipid fractions as risk factors.<sup>12</sup> Immanuel S et al suggested that a low level of HDL-cholesterol is associated with an increased risk of ischemic stroke, with an odds ratio of 3.09.<sup>13</sup> However, levels of total cholesterol, triglycerides, and high LDL-cholesterol do not pose a risk for ischemic stroke. Eckardstein et al proposed that HDL facilitates the transportation of cholesterol from the peripheral to the liver. A low amount of high-density lipoprotein (HDL) results in an accumulation of cholesterol in the artery wall, potentially leading to the formation of atherosclerotic plaques.<sup>14</sup>

## CONCLUSION

Lipids play a crucial role in increasing the risk of stroke, and it is important to consider lipid profile assessment when predicting an individual's risk of stroke. It is important to consider lipid profile

assessment when calculating an individual's risk of stroke.

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