

## Original Research Article

# A case control study: to evaluate the lipid profile in ischemic and hemorrhagic stroke

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**Received:** 27 February 2021

**Revised:** 14 March 2021

**Accepted:** 15 March 2021

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### ABSTRACT

**Background:** Stroke, be it ischemia or hemorrhage, is the most common clinical manifestation of cerebrovascular disease of which more than 99% are due to arterial involvement and less than 1% due to venous involvement. The aim of the present study was to assess the lipid profile of patients with ischemic and hemorrhagic stroke and to compare it with control group.

**Methods:** This study was conducted in the Department of Medicine in collaboration with Department of Biochemistry between February 2018 to August 2018 on 50 patients of infarct and 50 patients of hemorrhagic stroke admitted in GMC Jammu and 50 healthy controls. Serum was analyzed for estimation of serum lipid profile including total cholesterol, triglyceride, high density lipoprotein-cholesterol (HDL-C), low density lipoprotein-cholesterol (LDL-C), by using fully automatic analyzer.

**Results:** More than 54% of patients and controls belonged aged more than 60 years, with a total of 81 males and 69 females. Mean values of total cholesterol ( $233.53 \pm 27.09$  mg) and LDL ( $165.89 \pm 30.54$  mg) showed up higher in hemorrhagic stroke patients however higher mean values of triglycerides ( $177.80 \pm 40.44$  mg) showed up in ischemic stroke patients. Serum cholesterol was abnormal among 50% ischemic and 54% hemorrhagic patients. A significant association is found between raised cholesterol, LDL, abnormal HDL and ischemic stroke.

**Conclusions:** A significant rise in total cholesterol level was found in case of both the groups, therefore high risk patients with stroke should be regularly screened for serum lipid profile.

**Keywords:** Stroke, Total cholesterol, High density lipoprotein-cholesterol, Low density lipoprotein-cholesterol, Triglycerides

### INTRODUCTION

Stroke is the cause of one in eight deaths. It also leads to a huge burden of disability for the patients and trauma for their relatives.<sup>1</sup> It is distinct due to rapidly developing symptoms and cerebral function lasting for at least 24 hours with possibly no other cause but of vascular origin.<sup>2</sup> The national commission of macroeconomics and health has projected up to 1.67 million stroke cases per year in India by 2015 onwards. Globally, with reference to WHO figures, death rates were found to be 5.8 million

in 2005 and is expected to rise 7.8 million in 2030. Stroke is the most common clinical manifestation of cerebrovascular disease of which more than 99% are due to arterial involvement and less than 1% due to venous involvement in the form of cerebral venous thrombosis (CVT); of these arterial causes, 85%/15% are due to infarction/hemorrhage.<sup>3</sup>

Risk factors that are further classified as 'modifiable', 'non-modifiable' and 'non-lifestyle', increase the risk for stroke. Non-modifiable risk factors for stroke include old age, gender (male), ethnicity, family history and prior

history of stroke.<sup>4</sup> Modifiable risk factors include cigarette smoking and illicit drug use. Non-life style risk factors include low socioeconomic status, arterial hypertension, dyslipidemia, heart disease and asymptomatic carotid disease. In a study, Millikan and Siekert have found that worsening of neurological symptoms after a stroke is a matter of clinical interest among doctors.<sup>5</sup> Various attempts to find predictors of neurological decline is not universally vetted by clinicians. There are two major stroke types: Ischemia and hemorrhage. Ischemia is that type of stroke, where there is a blockage of blood vessels due to which lack of blood flow to the affected area takes place whereas hemorrhagic stroke is the rupture of blood vessels due to which there is some kind of blood leak in the affected area. Several clinical trials showed an association between higher concentrations of serum cholesterol and ischemic stroke.<sup>6</sup> On one hand, case control studies, which examined cholesterol as a risk factor in stroke, have generally produced negative findings and on the other hand prospective studies have mostly not been able to show a direct and strong association.<sup>7</sup> Different clinical studies have shown that increased serum cholesterol is a risk factor for ischemic stroke due to this reason it is important to evaluate the differences in serum lipid levels in particular strokes to help lipid-lowering through therapies that can decrease the incidence of stroke and subsequent mortality.<sup>8</sup> There were not many studies of the kind done in area and particularly in this part of India, therefore, the objective of the study was to assess the lipid profile of patients with ischemic and hemorrhagic stroke and to compare it with control group.

## METHODS

The present case-control-study was conducted in the Department of Medicine in collaboration with Department of Biochemistry for a period of 6 months from February 2018 to August 2018. 100 stroke patients admitted in GMC Jammu and 50 healthy controls were selected through 'simple random sampling' and taken for study. Out of 100 patients, 50 patients of infarct and 50 patients of hemorrhagic stroke were selected. Their detailed history was recorded. General physical

examination, detailed systemic examination and investigations were carried out. All patients with clinically and radiologically proven cerebrovascular accident were included in the study. Written informed consent was taken from the patients. Ethical approval was taken from Institutional Ethical Committee. Patients having head injury, transient ischemic attack, brain tumour, subdural hematoma, subarachnoid hemorrhage, patient on hypolipidemic drugs, old myocardial infarction, and patients refused for consent were excluded from the study.

Total 5 ml of venous sample were collected from anterior cubital vein after 8 hrs of overnight fasting. Samples were centrifuged at 4<sup>0</sup> C for 15 minutes after incubation of 20 minutes for extraction of serum and serum was analyzed for estimation of serum lipid profile including total cholesterol, triglyceride, LDL cholesterol and HDL-cholesterol by using fully automatic analyzer.

The data was analyzed using SPSS-19 version (SPSS for windows), to ascertain mean, standard deviation and p-value. A p value of <0.05 was considered significant.

## RESULTS

In the present study 46% of ischemic stroke, 56% of hemorrhagic stroke and 38% of controls fell in the age group of more than 60 years. Statistically, least no of patients and controls belonged to the group: 20-40 years. There was however not much variation in the demographic population (males and females) with their total numbers standing and 81 males to 69 females, with males forming the major chunk in all the groups, subjects and controls (Table 1).

Mean values of total cholesterol (233.53±27.09 mg) and LDL (165.89±30.54 mg) showed up higher in hemorrhagic stroke patients however higher mean values of triglycerides (177.80±40.44 mg) showed up in ischemic stroke patients. HDL showed up similar value drop in both ischemic and hemorrhagic stroke patients. Several controls showed risen LDL values; however, Mean±SD stood at: 105.56±18.47 mg (Table 2).

**Table 1: Demographic distribution of study subjects.**

Variables	Age group (in years)			Total	
	20-40	41-60	>60		
Ischemic	Male	6	8	12	26
	Female	5	8	11	24
	Total	11 (22%)	16 (32%)	23 (46%)	50 (100%)
Hemorrhagic	Male	4	8	16	28
	Female	3	7	12	22
	Total	7 (14%)	15 (30%)	28 (56%)	50 (100%)
Controls	Male	5	12	10	27
	Female	5	9	9	23
	Total	10 (20%)	21 (42%)	19 (38%)	50 (100%)
Total	Males	15	28	38	81 (54%)
	Females	13	24	32	69 (46%)

**Table 2: Distribution of lipid profile among ischemic, hemorrhagic stroke and control patients.**

Lipid profile	Type of stroke	Meas±SD (mg/dl)
Total cholesterol	Ischemic stroke	223.78±26.53
	Hemorrhagic stroke	233.53±27.09
	Controls	174.12±28.16
LDL-C	Ischemic stroke	154.71±32.21
	Hemorrhagic stroke	165.89±30.54
	Controls	105.56±18.47
Triglycerides	Ischemic stroke	177.80±40.44
	Hemorrhagic stroke	171.57±32.86
	Controls	119.94±24.48
HDL-C	Ischemic stroke	31.92±5.67
	Hemorrhagic stroke	31.53±5.05
	Controls	48.67±8.42

**Table 3: Comparison of abnormal values of lipid profile among patients in ischemic stroke and hemorrhage stroke with controls.**

Lipid parameters	Ischemic stroke	Hemorrhagic stroke	Controls	P value
Serum cholesterol >200 mg (%)	25 (50)	27 (54)	8 (16)	>0.05
				<0.001
LDL-C >100 mg (%)	42 (84)	38 (76)	33 (66)	>0.05
				<0.001
Triglycerides >150 mg (%)	20 (40)	18 (36)	13 (26)	>0.05
				<0.001
HDL-C <40 mg (%)	26 (52)	24 (46)	21 (42)	>0.05
				>0.001
				>0.001

Serum cholesterol was abnormal among 50% ischemic and 54% hemorrhagic patients, but 84% controls had normal values. The comparative values were statistically significant with  $P < 0.001$ . Triglycerides too showed up abnormal values among 40% and 36% ischemic & hemorrhagic patients; however only 74% controls showed normal values. P value for comparative values of lipid parameters among ischemic and hemorrhagic patients were not significant  $p > 0.05$ , however were very significant ( $p < 0.001$ ) when compared to controls in case of serum cholesterol, LDL and triglycerides (Table 3).

## DISCUSSION

Stroke is a clinical syndrome characterized by developing symptoms and/signs of focal and at times global loss of cerebral functions, with symptoms lasting more than 24 hours or leading to death with no apparent cause other than that of vascular origin.<sup>9</sup>

Qizilbash et al in review of 10 studies examining the relationship between serum total cholesterol and subsequent stroke concluded that there was a significant association however, other studies were less conclusive.<sup>10</sup>

A significant association is found between raised LDL, abnormal HDL and ischemic stroke. Lipid derangement thus formed an important risk factor for stroke. Definitely, a strong association has been found between high levels of serum cholesterol- mainly of low-density lipoprotein (LDL) cholesterol and the development of atherosclerosis, and elevated levels of HDL also seem to play a protective role. Quite similar to this, a study conducted by Anuradha et al a statistically significant association was observed ( $p < 0.001$ ) between the parameters of lipid profile of cases and healthy controls, and also with the prognosis of the stroke.<sup>11</sup>

Xiaoying et al also studied lipid profile TC, LDL-C, triglyceride and triglyceride/HDL-C ratio was positively associated with ischemic strokes in Chinese adults.<sup>12</sup> However Nagswa et al conducted among Japanese showed no relationship between TC and ischemic stroke, which could be due to their lower percentage of atherothrombotic infarction and higher percentage of cardioembolic infarction which are both subtypes of cerebral infarction.<sup>13</sup> Dyslipidemia is associated with both types of strokes. However, hypercholesterolemia is significantly being significantly more associated with

ischemic CVA. Low HDL-cholesterol is significantly more prevalent in ischemic CVA group in our study.

Hyperlipidemia was present in 16% patients of stroke and was the 3rd most risk factor stroke in the study by Khan et al, while Chaudhary et al showed hyperlipidemia in 21% of all 200 patients of stroke.<sup>14,15</sup>

The shortcoming or limitations of this present study was in the sample size and in the need to include the 'very low density lipoprotein cholesterol (VLDL-C)' among the set of tests to be undertaken.

## CONCLUSION

There was not much difference in the serum lipid profile outcome between the two types of strokes. However, a significant rise in total cholesterol level was found in case of both the groups. High risk patients with stroke should be regularly screened for serum lipid profile and further studies with a larger sample size should be undertaken to clearly zoom in an appropriate lipid lowering therapy to reduce the mortality associated with both hemorrhage and ischemic stroke patients.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the institutional ethics committee*

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**Cite this article as:** Sharma C, Badyal A. A case control study: to evaluate the lipid profile in ischemic and hemorrhagic stroke. *Int J Sci Rep* 2021;7(4):235-8.