

### **Ischaemic Stroke and its association with Lipid Profile**

<sup>1</sup>Anupa prasad, <sup>2</sup>Pummy Kumari, <sup>\*3</sup>Tannu Kumari and <sup>4</sup>Mukesh Kumar Agrawal

<sup>1</sup>Associate Professor, Department of Biochemistry, RIMS, Ranchi

<sup>2</sup>M.Sc Biotechnology, Marwari College, Ranchi,

<sup>\*3</sup>Scientist II, Biomedical Informatics Centre (ICMR), Department of Biochemistry, RIMS, Ranchi

<sup>4</sup>Senior Resident, Department of Medicine, RIMS, Ranchi

**Correspondence Author:** Tannu Kumari, Scientist II, Biomedical Informatics Centre (ICMR), Department of Biochemistry, RIMS, Ranchi

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#### **Abstract**

Stroke is the leading cause of death, and is the main cause of severe disability. Serum lipids are thought to interact with the pathogenesis of stroke through an atherosclerosis mechanism. Studies of lipid related risk factors in cerebrovascular disease have varied greatly in their findings. The relation between serum lipids and ischaemic stroke remains controversial. The aim of the present study is to observe the serum lipid profile in ischaemic stroke patients and to find out an association between the two.

#### **Introduction**

Stroke is sudden onset of any neurological disturbance, including limb weakness or numbness, speech disturbance, visual loss or disturbance of balance [1]. A transient ischaemic attack is defined as stroke symptoms and signs that resolve within 24 hours. Stroke is also a leading cause of morbidity, with 20% of survivors requiring institutional care after 3 months and 15-30% remaining permanently disabled [2]. Of all strokes, 88% are classified as ischemic, and the remainder 12% comprise of hemorrhagic, either subarachnoid (9%) or intracerebral (3%). After coronary heart disease and all cancers, stroke is the third most common cause of death worldwide and this causes 10-12% death worldwide [3].

Older age, family history of thrombotic stroke, diabetes mellitus, hypertension, tobacco smoking, abnormal blood cholesterol [particularly, low high-density lipoprotein (HDL) and/or high low-density lipoprotein (LDL)], and other factors are probable risk factors for stroke [4-6]. Studies have shown that elevated levels of serum lipids are important risk factors for the development of atherosclerosis. Elevated plasma concentration of low density lipoproteins (LDL) and low levels of high density lipoprotein (HDL) concentrations are associated with an increased risk of atherosclerosis [7]. The relationship between atherosclerosis and elevated serum lipids have been studied by researchers and aggressive treatment of dyslipidemia decreases the risk of stroke. Several studies have been made to study dyslipidemia in stroke [8-9] while the results are sometimes conflicting. Studies of cholesterol levels in stroke patients have revealed results varying from insignificant changes to a moderate elevation. The objective of the present study is to observe the serum lipid profile in ischaemic stroke patients and to find out an association between the two.

#### **Materials and methods**

A detailed history and physical examination of the patients of stroke were collected from the department of

medicine. The investigation (fasting lipid profile) was done in the Department of Biochemistry and data analysis was done at Biomedical Informatics Centre under Department of Biochemistry, RIMS, Ranchi, India. A total of 146 samples were considered including 74 controls and 72 cases comprising of both males and females. The study was carried out on patients presenting with stroke from January to August 2017.

**Results**

A total of 146 subjects were included in the present study including 48 females and 196 males. The mean age was 58 years. Among the total subjects males were more commonly affected with stroke, 43.9 % with ischaemic stroke and 12.2% with lacunar stroke as compared to females (27.1% ischaemic stroke and 8.3% lacunar stroke). Table 1 shows only 3.6 % of Ischaemic stroke patients had cholesterol level in borderline reference range whereas in control only 2.7% patients had cholesterol in higher and 9.5 % in borderline reference range but this was statistically not significant (p value 0.26).

Table 1: cholesterol abnormalities in patients based on type of stroke

Stroke type	Cholesterol Level			P-value
	borderline	high	normal	
Control	7(9.5%)	2(2.7%)	65(87.8%)	0.266
Ischaemic Stroke	2(3.6%)	0(0.0%)	54(96.4%)	
Lacunar Infarct	0(0.0%)	0(0.0%)	16(100.0%)	

Table 2 HDL abnormalities in patients based on type of stroke

Sex	Stroke type	HDL Level		P Value
		Low	Normal	
Female	Control	14(45.2%)	17(54.8%)	0.594
	Ischaemic Stroke	7(53.8%)	6(46.2%)	
	Lacunar Infarct	1(25.0%)	3(18.8%)	
Male	Control	41(95.3%)	2(4.7%)	0.662
	Ischaemic Stroke	42(97.7%)	1(2.3%)	
	Lacunar Infarct	12(100.0%)	0(54.2%)	

Table 2 shows only majority of the patients, both male and females had low HDL level in control group, ischaemic stroke or lacunar infarct. However the result was statistically not significant (p value 0.59 in females and p value 0.66 in males).

Table 3: LDL abnormalities in patients based on type of stroke

Stroke type	LDL Level		P-Value
	borderline	Normal	
Control	2(2.7%)	72(97.3%)	0.742
Ischaemic Stroke	2(3.6%)	54(96.4%)	
Lacunar Infarct	0(0.0%)	16(100.0%)	

Table 3 shows majority of the patients, both male and females had normal level of LDL in control group, ischaemic stroke and lacunar infarct. 3.6% of patient of ischaemic stroke patient and 2.7% of control group had

LDL level in borderline reference range. However the results were statistically non significant (p value 0.74)

Table 4: TG abnormalities in patients based on type of stroke

Stroke type	TG Level			P-value
	borderline	high	normal	
Control	12(16.2%)	2(2.7%)	60(81.1%)	<0.0001
Ischaemic Stroke	25(44.6%)	5(8.9%)	26(46.4%)	
Lacunar Infarct	5(31.2%)	3(18.8%)	8(50.0%)	

Table 4 shows 44.6% of ischaemic stroke patients have TG level in borderline and 8.9% patients had TG level in higher reference range. More than 50% of the patients of lacunar stroke patients had TG level in borderline and higher reference range. The results are statistically highly significant (p value <0.0001)

Table 5: Lipid profile of the patients enrolled in the study in regard with the stroke's subtype.

	Control	Ischaemic Stroke	Lacunar Infarct	P value (Control Vs Ischaemic Stroke)	P value (Control Vs Lacunar Infarct)	P value (Ischaemic Stroke Vs Lacunar Infarct)
Cholesterol	162.91 ± 40.19	153.21 ± 27.11	170.06 ± 19.30	0.241	0.725	0.189
HDL	39.52 ± 5.86	40.23 ± 4.25	41.38 ± 2.12	0.700	0.372	0.700
TG	142.67 ± 43.23	186.57 ± 104.60	207.75 ± 63.07	0.003	0.005	0.578
LDL	93.75 ± 21.21	80.55 ± 21.09	86.93 ± 21.10	0.002	0.473	0.538

The patients' lipid profile in regard with the etiology of the stroke is marked in table 5. There was no significant difference among control, ischaemic and lacunar lipid profile, except for the TG values when both control Vs ischaemic (P value 0.003) and Control Vs lacunar group (p value 0.005) was considered. However difference in LDL levels only in control Vs ischaemic group was also found (p value 0.002).

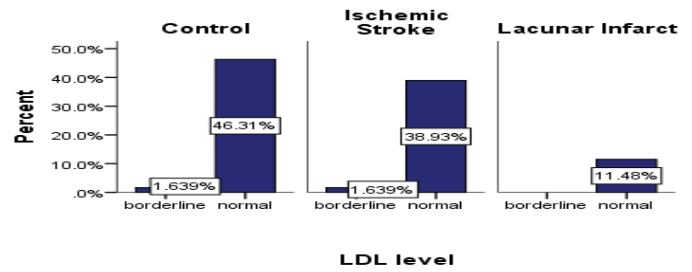


Figure 1: Comparison of LDL in patients of three groups based on type of stroke

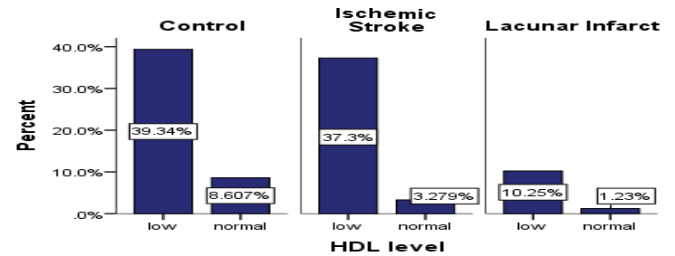


Figure 2: Comparison of HDL in patients of three groups based on type of stroke

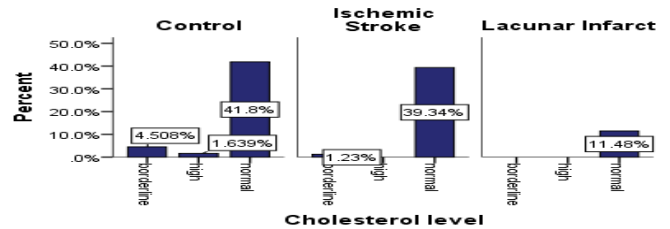


Figure 3: Comparison of Cholesterol in patients of three groups based on type of stroke

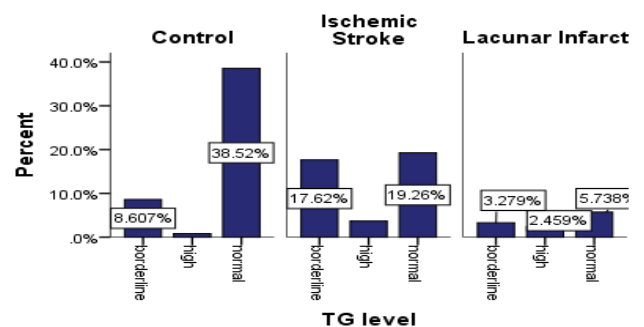


Figure 4 Comparison of TG in patients of three groups based on type of stroke

Figure 1, 2, 3 and 4 shows the comparison of lipid profile in control group, ischaemic stroke group and lacunar stroke group.

### Discussion

There had been plenty of research to study the lipid profile among the stroke patients. There is lot of ambiguity in the findings suggested by researchers as the results are many a times contradictory. Earlier studies showed a positive relation between serum cholesterol and non hemorrhagic stroke where as in the present study there is no association of serum cholesterol with ischaemic stroke or lacunar stroke.

The present study showed higher levels of total cholesterol in patients with ischaemic stroke compared with the control group. The same results were also suggested by some other studies [10, 11]. The Data on the association between serum TG and stroke have been inconsistent. Serum TG was varied significantly when comparison between control Vs ischaemic and control Vs lacunar infarct group was considered. However serum TG did not significantly varied when ischaemic and lacunar infarct group was considered.

The results are in accordance with Holme et al [12], Ogunrin et al [13] and Festus et al [14] who all found elevated triglyceride the most prevalent pattern in dyslipidemia and, Laloux et al. [15] who have reported high TG is commonly found in patients with ischaemic stroke whatever the etiologic subtype. However the findings are against the findings of researchers [16, 17].

Researchers [18, 19] reported association between triglyceride and ischaemic stroke, but others reported no such association [20]. We have found no significant association between cholesterol and ischaemic and lacunar stroke however which is similar to Framingham Study [21] in which no clear associations were reported.

Togha et al [19] found a significant association between cholesterol and ischaemic stroke when compared with controls. Serum LDL cholesterol varied significantly when control and ischaemic stroke group was compared which is in accordance to the Cardiovascular Health Study showing a positive association between LDL cholesterol and the risk of ischaemic stroke [22].

### Conclusion

In our study serum cholesterol, HDL cholesterol and LDL cholesterol did not show any significant effect on ischaemic stroke. Serum triglyceride level showed significant effect on stroke ( $p < 0.0001$ ). Serum triglyceride appears to be an important risk factor for ischaemic stroke. Hence we suggest that lower triglyceride level should be considered for primary prevention of stroke.

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