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Original Research Article

Comparative lipid profile study between ischemic and haemorrhagic stroke

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ABSTRACT

Background: Stroke is one of the major global health problems. 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). Among arterial causes 85% are due to infarction and 15% due to haemorrhage.[1,2] There is difference in serum lipid levels in subtypes of strokes to guide lipid-lowering therapy which can reduce incidence of stroke and stroke related mortality by adapting primary and secondary preventive measures.[3,4] Authors have endeavoured to correlate severity of lipid derangement and stroke.
Methods: In this study 64 consecutive eligible ischaemic stroke cases and 64 eligible hemorrhagic stroke cases would be included. Cases of strokes will be divided into ischaemic and hemorrhagic as per clinical features and with help of brain imaging by CT scan and MRI at the time of admission and 8 hour fasting lipid profile was collected from all cases. All this information will be filled in preformed format.
Results: Serum lipid profile of two categories of stroke showed raised serum total cholesterol in 39.1% patients of ischaemic stroke in contrast to 18.8% patients with haemorrhagic stroke (p=0.019).
Stroke patients showed raised in LDL cholesterol in 29.7% patients of ischaemic stroke in contrast to 9.4% patients with haemorrhagic stroke, (p=0.007).
Conclusions: Based on the finding of our study we conclude that ischemic stroke patient had higher lipid derangement as compare to haemorrhagic stroke in terms of raise total cholesterol, LDL cholesterol and decrease HDL cholesterol.

Keywords: Haemorrhagic, High density lipoproteins cholesterol, Ischaemic, Low-density lipoproteins cholesterol, Lipid-lowering therapy, Stroke

INTRODUCTION

Stroke is one of the major global health problems. The average annual incidence rate and case fatality rate of stroke in India is higher than the western countries. It is the leading cause of adult disability. The national commission of macroeconomics and health has estimated that there will be 1.67 million stroke cases in India by 2015. Stroke is also a predisposing factor for epilepsy, falls and depression in developed countries and is a leading cause of functional impairments, with 20% of survivors requiring institutional care after 3 months and 15% - 30% being permanently disable.

The term stroke is applied to a sudden focal neurologic deficit, specifically caused by cerebrovascular disease.

The term cerebrovascular disease designates any abnormality of the brain resulting from a pathologic process of the blood vessels, including occlusion of the lumen by embolus or thrombus, rupture of a vessel, an altered vessel wall permeability , or increased viscosity or other change in the quality of the blood flowing through the cerebral vessels. These are two main types-ischemia, with or without infarction, and hemorrhage.

Stroke is the most common clinical manifestation of cerebrovascular disease of which more than 99% are due to arterial involvement and lees than 1% due to venous involvement in the form of cerebral venous thrombosis (CVT). Among arterial causes 85% are due to infarction and 15% due to haemorrhage.[1]

Risk factors, that may be classified as modifiable and non-modifiable, increase the risk for stroke. Non modifiable risk factors for stroke include old age, male gender, ethnicity, family history and prior history of stroke. Modifiable lifestyle risk factors include cigarette smoking and illicit drug use. Non-lifestyle risk factors include low socioeconomic status, arterial hypertension, dyslipidemia, heart disease and asymptomatic carotid artery disease.[2] It is important to evaluate the difference in serum lipid levels in subtypes of strokes to guide lipid-lowering therapy which can reduce incidence of stroke and stroke related mortality by adapting primary and secondary preventive measures.[3,4]

The relationship of cerebrovascular disease with lipids and lipoproteins are being studied along with many other risk factors as in coronary heart disease.[5,6] Several clinical trials showed an association between high concentrations of serum cholesterol and ischaemic stroke.[5,7] On the other hand, case-control studies of stroke which examined cholesterol as a risk factor have generally produced negative findings and prospective studies have generally failed to show a direct and strong association.[7-9] Some demonstrated an inverse relation between total cholesterol and death from haemorrhagic stroke.[10] Therefore, the association between abnormal lipid profile and stroke may not be as straight forward as for coronary heart disease. There is an established effect of serum lipid levels on short term mortality due to strokes.[11]

The aim of study to determine the difference in lipid profile including serum Total Cholesterol, High Density Lipoprotein(HDL),Low Density Lipoprotein(LDL) and Triglyceride level among ischemic and hemorrhagic stroke patients.

METHODS

This one-year observational comparative study was carried out among 128 stroke patients admitted in SMS Hospital, where 64 patients are cases of infarct and remaining 64 cases of haemorrhagic stroke. Duration of Study was one year (April 2016 - March 2017).

The patients who satisfied the selection criteria were enrolled in study.

Inclusion criteria

- All patients with clinically and radiologically proved cerebrovascular accident

Exclusion criteria

- Head injury
- Transient ischemic attack.
- Brain tumour.
- Subdural hematoma.
- Subarachnoid hemorrhage.
- Patients on hypolipidemic drugs.
- Old myocardial infarction
- Patient refused for consent.

Statistical analysis

Continuous data would be summarized in form of Mean±Standard Deviation. Count Data would be summarized in form of proportion. Difference in proportion would be analyzed using Chi Square Test. The level of significance would be kept 95% for all statistical analysis. The data obtained was coded and entered into Microsoft Excel Worksheet (Annexure III). The categorical data was expressed as rates, ratios and proportions. The continuous data was expressed as mean±standard deviation (SD). The comparison of categorical data was done using Chi-square test or Fisher's exact test and the comparison of continuous data was done using independent sample 't' test. A probability value ('p' value) of less than or equal to 0.050 at 95% confidence interval was considered as statistically significant.

RESULTS

Subjects in both groups were age matched with no significant difference (p=0.848) with mean age of Hemorrhagic Stroke patients and Ischaemic stroke patients was 58.6 and 58.1 respectively. Subjects in both groups were also sex matched with no significant difference (p=0.555) with male preponderance was noted with 71.9% of patients being male. The male to female ratio in patients of Hemorrhagic Stroke group and Ischaemic stroke group was 2.2 and 3 respectively (Table 1).

Diabetes and hypertension are modifiable risk factor associated with stroke. The prevalence of diabetes in Hemorrhagic Stroke patients and Ischaemic stroke patients was 9.4% and 10.9% respectively which was statistically not significant (p=1.000).

Prevalence of HTN was high in Hemorrhagic Stroke patients as compare to Ischaemic stroke patients. Prevalence of HTN in Hemorrhagic Stroke patients and

Ischaemic stroke patients was 76.6% and 56.25% respectively which was statistically significant (p=0.025) (Table 1).

Table 1: Distribution of study subjects.

Variable	Hemorrhagic stroke (n=64)	Ischaemic stroke (n=64)	p value
Age (yrs)	58.6	58.1	0.848
Male (%)	68.8	75	0.555
Diabetes (%)	9.4	10.9	1.000
Hypertension (%)	76.6	56.25	0.025

In this study mean LDL for hemorrhagic and ischemic stroke were 107.6±36.5 and 126±38.4 respectively. The difference in both groups for LDL was statistically significant found (Table 2) (Figure 1).

Table 2: Comparison of mean LDL (mg/dl) among study subjects.

Group	N	Mean	SD
Hemorrhagic stroke	64	107.6	36.5
Ischaemic stroke	64	126	38.4

t-test ---t = -2.770 with 126 degrees of freedom; p=0.006 (S).

In this study mean HDL for hemorrhagic and ischemic stroke were 40.3±7.4 and 37.1±7.5 respectively. The difference in both groups for HDL was statistically significant found (Table 3) (Figure 1).

Table 3: Comparison of mean HDL (mg/dl) among study subjects.

Group	N	Mean	SD
Hemorrhagic Stroke	64	40.3	7.4
Ischaemic stroke	64	37.1	7.5

t = 2.411 with 126 degrees of freedom; p = 0.017 (S)

In this study mean TG for hemorrhagic and ischemic stroke were 115.4±37.2 and 130.3±42.1 respectively. The difference in both group for TG was statistically significant found (Table 4) (Figure 1).

Table 4: Comparison of mean TG (mg/dl) among study subjects.

Group	N	Mean	SD
Hemorrhagic stroke	64	115.4	37.2
Ischaemic stroke	64	130.3	42.1

t-test ---t = -2.126 with 126 degrees of freedom; p = 0.035 (S)

In this study mean TC for hemorrhagic and ischemic stroke were 171.8±52.9 and 191.1±34.6 respectively. The difference in both group for TC was statistically significant found (Table 5) (Figure 1).

Table 5: Comparison of mean TC (mg/dl) among study subjects.

Group	N	Mean	SD
Hemorrhagic Stroke	64	171.8	52.9
Ischaemic stroke	64	191.1	34.6

t-test ---t = -2.446 with 126 degrees of freedom; p = 0.016 (S)

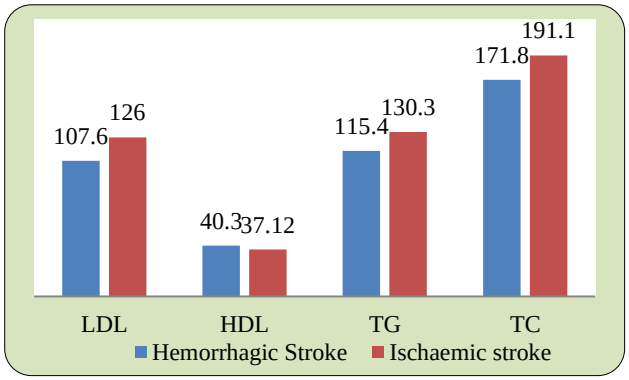

Figure 1: Lipid profile of hemorrhagic and ischaemic stroke.

Table 6: Distribution of study subjects according to lipid profile.

Variable	Hemorrhagic stroke (%)		Ischaemic stroke (%)		p value
	Normal	Deranged	Normal	Deranged	
LDL	90.6	9.4	70.3	29.7	0.007
HDL	46.9	53.1	26.6	73.4	0.028
TG	87.5	12.5	75	25	0.113
TC	81.2	18.8	60.9	39.1	0.019

Deranged LDL among subjects with hemorrhagic stroke was 9.4% and subjects with ischemic stroke was 29.7% found. There was statistical significance found between deranged LDL and hemorrhagic and ischemic stroke. Deranged HDL among subjects with hemorrhagic stroke was 53.1% and subjects with ischemic stroke was 73.4% found. There was statistical significance found between deranged HDL and hemorrhagic and ischemic stroke. Deranged TG among subjects with hemorrhagic stroke was 12.5% and subjects with ischemic stroke was 25% found. There was no statistical significance found between deranged TG and hemorrhagic and ischemic

stroke. Deranged TC among subjects with hemorrhagic stroke was 18.8% and subjects with ischemic stroke was 39.1% found. There was statistical significance found between deranged TC and hemorrhagic and ischemic stroke (Table 6).

The findings of this study indicate that abnormal lipid profile among subjects with stroke is continuously on rising trend especially with middle age to old age. Abnormal TC, LDL, HDL, and elevation in triglyceride level can be used as reliable indicators of stroke. Our study also makes a note that abnormal TC, LDL, HDL are becoming common in patients of stroke. In our study we found that more lipid profile derangement in ischemic stroke as compare to hemorrhagic stroke.

DISCUSSION

Lipid derangement is important risk factor for stroke. Strong association has been found between high levels of serum cholesterol - especially of low-density lipoprotein (LDL) cholesterol - and the development of atherosclerosis, while elevated levels of high-density lipoprotein (HDL) cholesterol seem to play a protective role.

Fasting serum lipid profile of haemorrhagic and Ischaemic stroke patients show raised serum total cholesterol in 18.8% of Hemorrhagic Stroke patients as compare to 39.1% of Ischaemic stroke patients (p=0.019) with mean serum total cholesterol of 171mg/dl and 191.1 mg/dl respectively (p=0.016). There is significant association between raised serum total cholesterol and Ischaemic stroke. In study done by Sugata Roy Chaudhary et al, found that fasting serum lipid profile analysis of 50 ischemic stroke patients revealed raised serum total cholesterol in 21 patients with mean serum cholesterol of 190±35mg/dl whereas only 5 patients among hemorrhagic CVA showing raised serum cholesterol with mean of 151±29mg/dl. So there is significant difference between two groups with p value 0.0006 (<0.05).[12]

Similarly, there is significant association between raised serum LDL cholesterol and Ischaemic stroke. Serum LDL-cholesterol was raised in 9.4% of Hemorrhagic Stroke patients as compare to 29.7% of Ischaemic stroke patients (p=0.006) with mean serum total cholesterol of 107.6mg/dl and 126 mg/dl respectively (p=0.007). In study done by Sugata Roy Chaudhary et al, found that fasting serum lipid profile analysis of 50 ischemic stroke patients revealed raised serum LDL cholesterol in 6 patients with mean serum LDL cholesterol of 102±21mg/dl whereas only 4 patients among hemorrhagic CVA showing raised serum LDL cholesterol with mean of 93±17mg/dl. So there is not significant difference between two groups with p value 1.0000 (>0.05).[12]

Comparison of serum lipid profile of two categories of stroke showed a low serum HDL cholesterol in 73.4% patients of ischaemic stroke in contrast to 53.1% patients with haemorrhagic stroke, which is significant at a p value of 0.028. The mean serum HDL cholesterol of 37.1 mg /dl with SD of 7.5 and 40.3 mg/dl with SD of 7.4 in ischaemic stroke and haemorrhagic stroke respectively. In study done by Sugata Roy Chaudhary et al, found that fasting serum lipid profile analysis of 50 ischemic stroke patients revealed low serum HDL cholesterol in 32 patients with mean serum HDL cholesterol of 42.4±6mg/dl whereas only 6 patients among hemorrhagic CVA showing low serum HDL cholesterol with mean of 45.4±5mg/dl. So, there is significant difference between two groups with p value 0.0022 (<0.05).[12]

CONCLUSION

Based on the finding of our study we conclude that ischemic stroke patient had higher lipid derangement as compare to hemorrhagic stroke in terms of raise total cholesterol, LDL cholesterol and decrease HDL cholesterol.

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

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