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Association Between Blood Lipids and Types of Stroke

KEYWORDS

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ABSTRACT *Introduction: Several studies in the past failed to demonstrate the relationship between serum lipid profiles as a risk factor for stroke.*

Objective: Determine the relationship between serum lipid levels and the occurrence of different types of stroke.

Methods: A total of 100 patients were included in the study, with 50 consecutive patients of acute ischemic and hemorrhagic stroke and 50 non-stroke patients. The influence of serum lipid profiles was assessed.

Results: Ischemic stroke patients had lower mean levels of HDL and higher mean levels of total cholesterol, LDL, VLDL and triglycerides ($p<0.01$) than the control group. Hemorrhagic stroke patients had significantly lower levels of HDL and VLDL and higher levels of total cholesterol, LDL and triglycerides ($p<0.001$) than the control group.

Conclusions The type of stroke (ischemic or hemorrhagic) and the etiopathogenic subtype of CI must be considered when studying association between blood lipids and occurrence of stroke.

INTRODUCTION:

With a population of 1.2 billion today and growing, India finds itself staring at a stroke epidemic. According to India Stroke fact Sheet (2012), the estimated age adjusted prevalence rate range between84-262/1, 00,000 in rural and between 334-424/1, 00000 in urban areas[1, 2].

Although several clinical trials have showed an association between higher levels of triglycerides and stroke, it is tenuous at best[3, 4]. Interpreting the relationship between triglycerides and stroke is often confounded by the type of stroke under consideration (ischemic versus hemorrhagic). The MR FIT (Multiple Risk Factor Intervention Trial) showed that the risk for hemorrhagic stroke was inversely related to TC levels; however, risk for ischemic stroke increased as TC levels exceeded 200 mg/dL. In fact, the risk for ischemic stroke more than doubled when TC levels exceeded 280 mg/dL[5]. Similar results were shown in a health maintenance organization-based case-control study by Tirschwell et. al[6], which reported an increased risk of certain subtypes of ischemic stroke with higher TC and lower high-density lipoprotein (HDL) levels.

Identification and control of modifiable risk factors is the best strategy to reduce the burden of stroke, and the total number of strokes could be reduced substantially by these means[7, 8].

No study is available locally to compare all thecomponents of serum lipid profiles in ischaemic and haemorrhagic strokes. Therefore, this study was carriedout to compare serum lipid profiles in patients with ischaemic and haemorrhagic cerebrovascular accidentsto validate and develop guidelines in local patients.

MATERIALS & METHODS:

A case and control study was conducted to determine differences in serum lipid levels among individuals suffering different types of stroke.The study was approved by the Institutional Ethics Committee. All potential participants were giventhe necessary information about the study, and each participant provided written informed consent.

Participants included patients with firstever acute phase of stroke (within 24 to 72 hours of onset) admitted to Bharati Hospital, Sangli from December 2013 to November 2014. Stroke diagnosis was based on clinical examination and a cranial computer tomography (CT) scan.For our, the subjects were divided into 3 groups: cerebral infarction (CI) patients, cerebral hemorrhage (CH) patients, and a control group. The Ibero-American Society of Cerebrovascular Disease's criteria[9] for classification of cerebrovascular diseases were used for etio-pathogenesis. The control group consisted of individuals with no history of any Cerebrovascular Disease and were randomly selected from the geographic healthy areas of Sangli – Miraj district.

To determine serum lipids levels, blood samples were taken following a 12-hour fast, and then processed. Serum was stored at -20°Cfor no longer than 20 days. Lipid profile was determined by Coralyzer machine, using the Cholesterol oxidase/peroxidase method. Normal values for lipid variables used as reference were: total cholesterol: less than 200mg/dL; triglycerides: 101-150mg/dL; LDL: less than 100mg/dL and HDL: >60mg/dL

The data was analyzed using SPSS version 11.0.Mean values of thecholesterol, triglyceride, LDL-cholesterol, HDL-cholesteroland VLDL-cholesterol was determined. A simple-classification variance analysis (ANOVA) was used to compare lipid levels among the groups studied, and differ-

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ences among mean values obtained were defined by Tukey test[10]. For analysis,study groups; cerebral infarction (CI), cerebral hemorrhage (CH), and control group were considered as Independent variables. Serum lipid levels: LDL, HDL and total cholesterol (TC); and triglycerides (TG) were considered Dependent variables (continuous variables).

A statistical strength of 80% and a confidence level of 95% were considered when calculating the number of patients in the sample

RESULTS:

This study comprised of 50 controls and 50 CVA patients, out of whom 37 patients(74%)had infarctand remaining 13 patients (26%) had hemorrhagic stroke.

Chart 1 and Table 1 shows that CI patients had lower mean levels of HDL ($p<0.01$) and higher mean levels of totalcholesterol ($p<0.01$), LDL ($p<0.01$), VLDL ($p<0.01$) and triglycerides ($p<0.01$) than the control group – a statistically significant difference.Conversely, CH patients had significantly lower levels of HDL($p<0.05$) and VLDL ($p<0.05$) and higher levels of totalcholesterol ($p<0.01$), LDL ($p<0.01$) and triglycerides ($p<0.001$)than the control group.

Table 2 shows that mean cholesterol in ischemic group was 221.32mg% and in hemorrhagic group was 186.31 mg% with statistically significant p value ($p<0.001$) suggesting positive relation between total cholesterol and ischemic stroke. The mean LDL cholesterol in ischemic group was 142.14 mg% and in-hemorrhagic group was 124 mg% with statistically significant p value($p<0.001$). Among stroke patients, in ischemic group mean HDL was 30.54mg%, while in hemorrhagic group mean cholesterol was 36.08mg% which is statistically significant. In our study mean triglycerides in ischemic group was 167mg% and in hemorrhagic group was 151mg%, which is statistically insignificant ($p>0.05$). Mean VLDL in ischemic group was 34.54mg% and hemorrhagic it was group 26.15mg% which is statistically significant ($p<0.05$).

DISCUSSION:

Stroke is a clinical syndrome characterized by loss ofcerebral functions, with symptoms lasting more than 24hours or leading to death with no apparent cause other than that of vascular origin[11].

We have observed in our study that 76% and 34% patients suffered from ischemic and haemorrhagic stroke respectively which is very much similar to the studies conducted by Silvestrelli G *et at*[12] (67% vs 30.1%) and Zhang J *et al*[13] (78% vs 22%). But the studies conducted by Llibre JJ *et al*[14] and Walker RW *et al*[15] had shown higher incidences (>80%) of ischemic stroke.

Conflicting results exist in the literatureabout the correlation between the total plasmacholesterol of patients and the risk of stroke[16]. Togha et al[17] found a significant association between cholesterol and ischemic stroke when compared with controls. An increased level of both the total cholesterol and LDL was reported to be associated with higher risk of developing ischemic stroke.

In our study dyslipidemia was associated with both types of stroke. Their lipids profile wascharacterized by higher total cholesterol, LDL,VLDL and triglycerideslevels than those in the control group. However hypercholesterolemia was significantly more associatedwith ischemic CVA.Low HDL-cholesterol was significantly more prevalent in ischemic CVA group in our study. This aligned with the study conducted by Denti et al[18] which showed an independent association of low levels of HDL with risk of cerebral infarction. Atherosclerosis isconsidered to be the main pathology underlyingischaemic stroke as well as myocardial infarction. Serum HDL-cholesterol has anti-atherogenic properties with ability to trigger the flux of cholesterolfrom peripheral cells to the liver and thus having a protective effect[19]. However, recently it has beenobserved that serum HDL-cholesterol level decrease significantly at the time of acute ischaemic stroke and itmay be an acute phase reactant or nascent biomarker of acute stroke susceptibility[20].

Association between concentrations of serum triglyceridesand the risk of stroke is also overshadowed. Somestudies led to negative results whereas others showed apositive association with high serum triglyceride concentrations[21]. While Copenhagen City Heart Study[22] showed a log linear association between serum triglycerideconcentrations and non-haemorrhagic stroke, no significant difference was found of high plasma triglycerideconcentration as a risk factor for both types of stroke inthis study.

These counter-intuitive effects of serum lipids cannot betaken at face value without considering possible sourcesof bias in this study. A hospital population was examinedand referrals were admitted selectively for severity of thesymptoms and requiring immediate nursing and hospital care. On the other hand, a community study is likely tomiss those patients who die within 24 hours of the onsetof stroke

It has now been established that, the serum cholesterol measurements within the first 48 hours areidentical to those after three months, although a fall in concentration does occur between these times[23]. In our study, the blood samples were takenfrom the patients at the very beginning of thehospital stay (within the first 24 hours) most ofthe time before heparin administration, after12 hours fasting to prevent any false negative interpretation ofour data.

CONCLUSIONS:

Stroke is a multifactorial disease and that itsvarious causes are not equally associated with blood cholesterol levels. High risk patients of stroke may be screened using serum lipid profile and further studies are suggested to evaluate the effect of other factors in terms of morbidity and mortality inischemic stroke patients.

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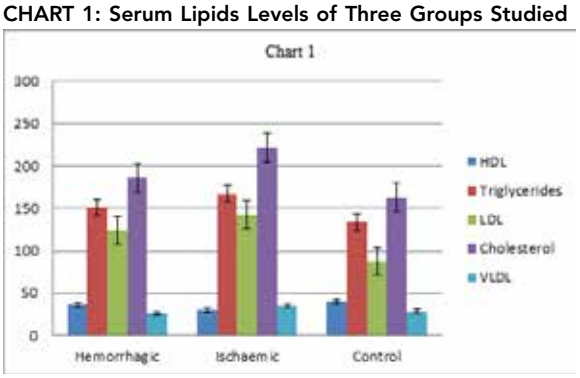
CHART 1: Serum Lipids Levels of Three Groups Studied



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TABE 1: RESUT OF ANOVA TEST

LIPID PROFILE	F	P
HDL	50.96	0.000
Triglycerides	10.88	0.000
LDL	42.52	0.000
Cholesterol	30.98	0.000
VLDL	3.91	0.023

TABE 2: LIPID PROFILE AND TYPE OF STROKE

	N	Mean	Std. Deviation	Std. Error Mean	T	p value
HDL						
HEMORRAGIC	13	36.08	3.77	1.05	-4.	0.000
ISCHEAMIA	37	30.54	4.22	0.69	409	
TG						
HEMORRAGIC	13	151.08	34.81	9.66	-1.277	0.212
ISCHEAMIA	37	167.11	48.83	8.03		
LDL						
HEMORRAGIC	13	124	23.24	6.45	-2.109	0.043
ISCHEAMIA	37	142.14	34.62	5.69		
TC						
HEMORRAGIC	13	186.31	18.57	5.15	-3.854	0.000
ISCHEAMIA	37	221.32	45.53	7.48		
VLDL						
HEMORRAGIC	13	26.15	4.32	1.2	-3.488	0.001
ISCHEAMIA	37	34.54	12.68	2.08		

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