Association Between Blood Lipids and Types of Stroke

KEYWORDS

Dr Rahul Surve  Dr. Chidanand Awalekar  Dr. Gaurav Salunke
MBBS, MD Medicine (Stud.), Department of Medicine, B.V.D.U. Medical College & Hospital, Sangli  MBBS, MD (Medicine), Professor & HOD, Department of Medicine B.V.D.U. Medical College & Hospital, Sangli  MBBS, MD (Microbiology), Assistant Professor, Department of Microbiology, B.K.L. Walawalkar Hospital, Dervan

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 between 84-262/1,00,000 in rural and between 334-424/1,00,000 in urban areas. 1-4

Although several clinical trials have shown an association between higher levels of triglycerides and stroke, it is tenuous at best 1-4. 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. Similar results were shown in a health maintenance organization-based case-control study by Tirschwell et. al 5, 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 6-9.

No study is available locally to compare the components of serum lipid profiles in ischaemic and haemorrhagic strokes. Therefore, this study was carried out to compare serum lipid profiles in patients with ischaemic and haemorrhagic cerebrovascular accident to 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 given the necessary information about the study, and each participant provided written informed consent.

Participants included patients with first-ever 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 subjects, we divided them into 3 groups: cerebral infarction (CI) patients, cerebral hemorrhage (CH) patients, and a control group. The Ibero-American Society of Cerebrovascular Disease’s criteria 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°C for 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 the cholesterol, triglyceride, LDL-cholesterol, HDL-cholesterol and VLDL-cholesterol were determined. A simple-classification variance analysis (ANOVA) was used to compare lipid levels among the groups studied, and differ-
ences among mean values obtained were defined by Tuk-
ey test15. For analysis, study groups; cerebral infarction (CI),
cerebral hemorrhage (CH), and control group were con-
sidered 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 infarct and remaining 13
patients (26%) had hemorrhagic stroke.

Chart 1 and Table 1 shows that CH patients had lower
mean levels of HDL (p<0.01) and higher mean levels of
total cholesterol (p<0.01), LDL (p<0.01), VLDL (p<0.01) and
triglycerides (p<0.01) than the control group – a statistical-
ly significant difference. Conversely, CH patients had signifi-
cantly lower levels of HDL (p<0.05) and VLDL (p<0.05) and
higher levels of total cholesterol (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 pa-
tients, 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 triglyc-
erides in ischemic group was 167mg% and in hemorrhag-
ic 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 statisti-
cally significant (p<0.05).

DISCUSSION:
Stroke is a clinical syndrome characterized by loss ofcer-
ebral functions, with symptoms lasting more than 24hours
or leading to death with no apparent cause other than that
of vascular origin11.

We have observed in our study that 76% and 34% patients
suffered from ischemic and haemorrhagic stroke respec-
tively which is very much similar to the studies conducted
by Silvestrelli G et al12 (67% vs 30.1%) and Zhang J et al13
(78% vs 22%). But the studies conducted by Llibre JJ et
al14 and Walker RW et al15 had shown higher incidences
(>80%) of ischemic stroke.

Conflicting results exist in the literature about the correla-
tion between the total plasmacholesterol of patients and the
risk of stroke16. Togha et al17 found a significant as-
so ciation between cholesterol and ischemic stroke when
compared with controls. An increased level of both the to-
tal 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 was characterized by higher
total cholesterol, LDL, VLDL and triglycerides levels than
those in the control group. However hypercholesterolemia
was significantly more associated with ischemic CVA. Low
HDL-cholesterol was significantly more prevalent in ischec-
ic CVA group in our study. This aligned with the study
conducted by Denti et al18 which showed an independent
association of low levels of HDL with risk of cerebral
infection. Atherosclerosis isconsidered to be the main
pathology underlyingischaemic stroke as well as myocar-
dial 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 ef-
fect19. However, recently it has been observed that serum
HDL-cholesterol level decrease significantly at the time of
acute ischaemic stroke and it may be an acute phase reac-
tant or nascent biomarker of acute stroke susceptibility20.

Association between concentrations of serum triglyceride-
sand the risk of stroke is also overshadowed. Some studies
lead to negative results whereas others showed a positive
association with high serum triglyceride concentrations21.
While Copenhagen City Heart Study22 showed a log lin-
ear 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 in this study.

These counter-intuitive effects of serum lipids cannot be-
taken at face value without considering possible sourcesof
bias in this study. A hospital population was examined and
referred admissions were admitted selectively for severity of
the symptoms and requiring immediate nursing and hospital care.
On the other hand, a community study is likely to miss
those patients who die within 24 hours of the onset of
stroke.

It has now been established that, the serum cholesterol
measurements within the first 48 hours are identical to
those after three months, although a fall in concentration
does occur between these times23. In our study, the blood
samples were taken from the patients at the very beginning
of the hospital stay (within the first 24 hours) most of the
time before heparin administration, after 12 hours fasting to
prevent any false negative interpretation of our data.

CONCLUSIONS:
Stroke is a multifactorial disease and that its various 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 mor-
tality in ischemic stroke patients.

ACKNOWLEDGEMENT:
The authors would like to thank Dr. Alka Gore for guiding us
for each & every step of this research work by giving useful
suggestions and made us complete this work successfully.

CHART 1: Serum Lipids Levels of Three Groups Studied
TABLE 1: RESULT OF ANOVA TEST

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<tr>
<th>LIPID PROFILE</th>
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<tr>
<td>HDL</td>
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<td>Triglycerides</td>
<td>10.88</td>
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<td>LDL</td>
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<td>Cholesterol</td>
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<td>VLDL</td>
<td>3.91</td>
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TABLE 2: LIPID PROFILE AND TYPE OF STROKE

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<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>T</th>
<th>p value</th>
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<tr>
<td>HDL</td>
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<td>TG</td>
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<td>LDL</td>
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<td>TC</td>
<td>13</td>
<td>186.31</td>
<td>18.57</td>
<td>5.15</td>
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<td>221.32</td>
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<td>VLDL</td>
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REFERENCES: