Original Article

Clinical Study of Lipid Profile in Intracerebral Haemorrhage in Tertiary Care Center

Thimmineni Haritha[1], Sanjay kumar Kaminwar[2], Anish Reddy P[3], Eshwaraiah Vanaparthy[4], Sunil Chowdary M[5]

[1]Assistant Professor, [2]Associate Professor, Department of Neurology Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, Telangana, India, [3]Associate Professor, Department of General Medicine Chalmeda Anand Rao Institute of Medical Sciences Karimnagar, Telangana, India, [4,5]Residents, Department of Neurology Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, Telangana, India.

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Abstract

Background: Stroke caused by Intracerebral haemorrhage (ICH) has high mortality rate. Among various risk factors for ICH, hypertension is the most important factor. Certain population studies have reported a paradox of inverse association between serum cholesterol and risk of ICH.

Aims and objectives: The study aim was to evaluate the serum lipid profile total cholesterol (TC), triglycerides (TGL), high density cholesterol (HDL-C), very low density cholesterol (VLDL-C) and low density cholesterol (LDL-C) in intracerebral haemorrhage patients and look for correlation.

Methods: 50 patients with ICH admitted in Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar who fulfilled the inclusion and exclusion criteria were selected. The study design was a hospital based observational clinical study. History, clinical examination and investigations (CT & MRI Brain and basic blood biochemistry with serum lipid profile) were collected and the data were analysed statistically.

Results: Majority of the ICH patients in our study were >55 years and were males. The total serum cholesterol was < 200mg/dl in 72 % of our patients, with a mean of 168.09 ±43.74mg%. Serum triglyceride level was patients, with mean of 108.26±43.31mg%. HDL-C was < 40 mg/dl in 76% of patients and VLDL-C was < 30mg/dl in 72% patients. The various lipid fractions observed were found to be low in majority of our ICH patients (p value < 0.05), suggesting a negative association between the two. The results obtained were comparable to other similar studies.

Conclusion: Majority of intracerebral haemorrhage patients in our study had lower levels of total cholesterol, triglyceride, HDL-C, LDL-C and VLDL-C. Whether the inverse association between serum lipid levels and ICH is a true causal association or only by chance due to other common confounding factors needs to be evaluated with large scale studies.

Keywords: Intracerebral haemorrhage, lipid profile, serum cholesterol, triglyceride, HDL-C, LDL-C, VLDL-C.

Corresponding Author: Sanjay Kumar Kaminwar, Associate Professor, Department of Neurology Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar-505001 Telangana, India.

E-mail: kaminwar@gmail.com

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Introduction

Intracerebral hemorrhage (ICH) is the second most common subtype of stroke after ischemic stroke and accounts for approximately 10 % to 20 % of all strokes. [1] Intracerebral hemorrhage occurs when a blood vessel within the brain parenchyma ruptures. Intracerebral hemorrhage can occur as a complication of a pre-existing lesion, such as vascular malformation or tumor, which is then referred to as secondary intracerebral hemorrhage.

Globally, higher stroke incidence and poor outcomes have been found in rural residents as compared to urban residents. This is linked to higher prevalence of stroke risk factors in rural areas. [2] Literature on stroke incidence, its subtypes, mortality and access to stroke services in rural India is limited. [3] In 2016, the Global Burden of Disease project estimated the number of incident cases of stroke in India to be 1,175,778. [4] In a recent systematic review, consisting mainly of cross-sectional studies, the incidence of stroke in India was estimated to be between 105 and 152/100,000 people per year. [5]

The incidence of stroke, both ischemic and hemorrhagic, in 2010 was approximately 33 million worldwide, with hemorrhagic strokes accounting for nearly a third of cases and over half of all the deaths. [6] Though the worldwide incidence sits at nearly 20 cases per 100,000 people every year, the occurrence of ICH in low/middle-income regions is double compared to the rates in more economically developed countries. [7] Fortunately, however, the mortality from such strokes has decreased worldwide. [6]

Intracerebral hemorrhage can be divided into primary and secondary, where primary bleeds account for 85% of all ICH and are related to chronic hypertension or amyloid angiopathy. Secondary hemorrhage is considered to be related but not limited to bleeding diathesis (iatrogenic, congenital, acquired), vascular malformations, neoplasms, hemorrhagic conversion of an ischaemic stroke, and drug abuse. [8]

Many of the previous clinical investigations have suggested that increased serum cholesterol is a risk factor for ischemic stroke. Its role in Intracerebral hemorrhage (ICH), however, is not clear. Few studies have indicated hypercholesterolemia as a risk factor for ICH. [9]

The present study aim was evaluate the serum lipid profile total cholesterol (TC), triglycerides (TGL), high density cholesterol (HDL-C), very low density cholesterol (VLDL-C) and low density cholesterol (LDL-C) in intracerebral haemorrhage patients and look for correlation.

Materials and Methods

Study Design

The study design was a hospital based observational clinical study. A total number of 50 patients who presented with Intracerebral Haemorrhage during the study period from January 2022 to July 2023 in Department of Neurology, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar and who fulfilled the inclusion criteria were taken for the study.

Inclusion criteria

- Patients admitted with Intracerebral Haemorrhage (ICH)
- Age 40 years to 80 years
- Gender

Exclusion criteria

- Traumatic Intracerebral Haemorrhage
- Subarachnoid haemorrhage
- CNS Tumors
- Intracranial Aneurysm
- Vascular malformations
- Sympathomimetics abuse
- History of bleeding diathesis
- Patients with thrombocytopenia

After obtaining informed consent, history, clinical examination and investigations were done. Diagnosis of Intracerebral haemorrhage was made in patients based on history, clinical features and plain non contrast CT scan of Brain.

Lipid profile estimation

Blood was collected for lipid profile estimation from the ICH patients within 24 to 48 hours of onset

of disease. The sample was collected after 9 to 12 hours of fasting. The serum was separated and was subjected to centrifugation .The supernatant was taken out and subjected for analysis.

Statistical Analysis:

The statistical analysis of the data collected from the patient was done using Statistical Package for Social Sciences software (SPSS).

Results

Out of 50 patients, 15 patients were females and 35 were males. The mean age group of this study is 59.1(± 12.61) years. In this study among the 50 patients of Intracerebral Haemorrhage, 48% belong to age group of 60-79 years 40% belong to age group of 40-59 years. 8% belong to above 80 years. 4% belong to below 40 years.

Table 1: Age and sex distribution of ICH

Age	Males	Females
Below 40 years	2	0
40-59 years	15	5
60-79 years	16	8
Above 80 years	2	2

The mean age group among the male patients with ICH was 58 years. The mean age group among the female patients with ICH was 62 years (Table 1).

Table 2: Site of ICH distribution

Site of ICH	No.of Patient (N=50)	Percentage (100%)
Basal Ganglia	28	56.0
Lobar	11	22.0
Thalamus	7	14.0
Cerebellum	3	6.0
Pons	1	2.0

Table 2 shows that Basal ganglia constitutes the most common site of ICH in our study, contributing to 56% of cases. Lobar ICH is the second most common site accounting for 22% of patients. Thalamic haemorrhage contributes to about 14% of patients. Cerebellar bleeds were 6% of the total cases. Pons was the site of ICH only in 2 % of study group.

Table 3: Outcome of ICH Patients

Outcome	No. of Patient (N=50)	Percentage (100%)
Alive	19	38.0
Dead	31	62.0

Table 3 shows among our ICH patients about 62% died. Remaining 38% are alive in our study.

Table 4: Total Cholesterol in Patients

Total Cholesterol (mg/dl)	No.of Patient (N=50)	Percentage (100%)
< 200	36	72.0
200 - 239	11	22.0
>240	3	6.0

A clear majority of patients around 72% in our study group had serum total cholesterol < 200mg/dl. 22% of patients had their serum total cholesterol within range of 200-239 mg/dl. Only 6 % of patients in our study had their serum cholesterol ≥ 240 mg/dl.

The mean total serum cholesterol of this study group was 168.09±43.74 mg/dl. To test the statistical significance of this relation we did a t-Test taking 200mg/dl as a normal total cholesterol for normal population. The study population was partitioned into two groups with this cut off.

Table 5: T-Test for Triglycerides

TGL IN mg/dl	Mean	S.D	Statistical Inference
< 150 (n=37)	100.757	29.009	T=-8.763
> 150 (n=13)	190.615	39.010	Df=48
			P value= <0.05
			Statistically Significant

37 ICH patients in our study had their serum triglyceride < 150 mg/dl and their mean triglyceride was 100.76 mg/dl. 13 ICH patients in our study had their serum triglyceride ≥ 150 mg/dl and their mean triglyceride was 190.62 mg/dl. Using t- test, there is statistically significant difference between the two means (P value <0.05) (table 5).

Table 6: HDL Cholesterol in Patients

HDL Cholesterol in mg/dl	No.of Patient (N=50)	Percentage (100%)
<40	38	76.0
40-59	9	18.0
>60	3	6.0

76% of patients in our study had their serum HDL-C < 40 mg/dl. 18% of patients had levels from 40-59 mg/dl. 6% of patients had levels ≥ 60 mg/dl (table 6). The mean HDL-Cholesterol level in the study population is 32.45± 15.30 mg/dl. To test the statistical significance of this relation we did a t-Test taking 40 mg/dl as a normal HDL cholesterol for normal population. The study population was partitioned into two groups with this cut off.

Table 7: T-test for VLDL Cholesterol

VLDL-C in mg/dl	Mean	S.D	Statistical Inference
< 30 (n=36)	20.408	5.977	T=-8.471 Df=48 P value=<0.05 ■ Statistically Significant

36 ICH patients in our study had their serum VLDL < 30 mg/dl and their mean VLDL was 20.41 mg/dl. 14 ICH patients in our study had their serum VLDL ≥ 30 mg/dl and their mean VLDL was 37.71 mg/dl. Using t- test, there is statistically significant difference between the two means (P value <0.05).

Discussion

The mean age group of ICH patients in our study was 59.1 (± 12.61) years. In comparison with Iribarren et al [10] where the mean age was 54.2 years and Broderick et al [3] where the mean age was 64.8± 16.1 years.

Majority of the patients (48%) belonged to age group of 60-79 years in our study. This observation was similar to that in a study Sunil KN et al [12] where about 46 % of patients were in 60-79 years group. In sex distribution, 70% of ICH patients in our study are males; 30 % of ICH patients are females in our study. The male: female ratio in our study is 2.3: 1.

Table 8: T-test for LDL Cholesterol

LDL-C	Mean	S.D	Statistical Inference
<130 (n=34)	84.6876	26.70511	T=-9.281 Df=48 P value= <0.05 Statistically Significant
> 130(n=16)	158.3375	24.97174	

34 ICH patients in our study had their serum LDL cholesterol < 130 mg/dl and their mean LDL cholesterol was 84.69 mg/dl. 16 ICH patients in our study had their serum LDL cholesterol ≥ 130mg/dl and their mean LDL cholesterol was 158.34 mg/dl. Using t- test, there is statistically significant difference between the two means (P value <0.05) (table-8).

Site of ICH

Basal ganglia is the common site of ICH in our study contributing to 56% of cases. This is in accordance with Amanda G. Thrift et al [13] in which basal ganglia is the most common site of ICH. This is also in concordance with Indian studies, Ashraf V. Valappil et al [14] and Suni KN et al [12] where basal ganglia was the most common site but the percentages were slightly lower 49% and 45% respectively.

Lipid Profile and ICH

Serum Total Cholesterol and ICH

A clear majority of patients around 72% in our study group, had serum total cholesterol < 200 mg/dl. Around 54% of our patients had their serum cholesterol values <160 mg %. The mean total serum cholesterol level of this study group was 168.09± 43.74 mg/dl. Comparing with international studies,

Multiple risk factor intervention trial (MRFIT) study [15] showed clear association between low serum cholesterol levels especially below 160 mg% with risk of ICH. The mean cholesterol levels in ICH patients in MRFIT study was 211.4 ± 43.9 mg/dl. The Honolulu Heart Program Yano et al study showed increased risk of ICH in those with serum cholesterol <189 mg%. [16]

In Konishi et al [17] study shows that the mean serum total cholesterol in ICH patients was 164± 2mg%. Comparing with Indian studies, [10] Ashraf V. Valappil et al study, [14] 43% of ICH patients had serum cholesterol <160 mg%. The mean serum total cholesterol in this study was 177 ± 39 mg%.

TGL and ICH

74% of patients in this study had their serum triglycerides level <150 mg/dl. The mean serum triglyceride among our study population was 124.12± 50.76 mg/dl. This is in concordance with Jared D. Sturgeon et al [18] where 81.48% of ICH patients had their serum triglyceride concentration <158 mg%. There was in discordance with Ashraf V.Valappil etal [14] where mean triglyceride concentration in was 84 ± 35.5 mg%.

HDL -C and ICH

76% of patients in our study had their serum HDL-C <40 mg/dl. The mean HDL-Cholesterol level in the study population is 32.45 ± 15.30 mg/dl. The mean HDL-C in Ashraf V. Valappil et al [14] was 42± 12 mg%

LDL-C AND ICH

In our study the serum LDL-cholesterol was <130mg /dl in 68 % of the ICH patients. The mean LDL-Cholesterol level in our study population was 108.26± 43.31mg/dl. Comparing with Izumi et al [19] 59.84% of ICH patients had LDL-C less than120 mg%.

VLDL-C and ICH

72% of ICH patients in our study had VLDL <30mg/dl. The mean VLDL-Cholesterol in our study population was 25.25± 10.14 mg/dl.

LIMITATIONS OF THE STUDY

- This study has included patients with intracerebral haemorrhage excluding the secondary causes of ICH. Though many foreign studies and some Indian studies have been conducted in studying lipid profile in ICH, only few studies are available in south India especially Telangana.
- The limitation of our study was that the dietary habits and physical activities of patients could not be explored.
- This study was based on a single center and hospital based, hence the results obtained may not reveal the true burden of the disease in the community taken as a whole.

Conclusion

Majority of intracerebral haemorrhage patients in our study had lower levels of total cholesterol, triglyceride, high density lipoprotein, low density lipoprotein and very low density lipoprotein. The following mechanism is proposed for inverse association of serum lipids and ICH. Cholesterol and triglycerides form an integral part of cell membrane of vascular endothelium and erythrocytes. When their levels are low, weakening of endothelium and increased erythrocyte fragility occurs, more significantly in the presence of hypertension which predispose to micro aneurysms and later on ICH. Whether the inverse association of serum cholesterol and ICH is a true causal association or only by chance due to some other common confounding factor needs to be evaluated with large scale studies. Further studies with larger sample size concentrating on the pathophysiological effects of serum lipids and ICH are very much essential.

Ethics Approval: This study was approved by the Institute Ethics committee, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar (IEC/CAIMS/2022/013) and informed consent was obtained.

Conflict of Interest: Nil

Funding: Nil

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