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Original Article

Admission Lipid Profile and Discharge Outcome in Ischemic and Hemorrhagic Stroke

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Abstract

Background: *Changes in the lipid profile have been suggested as a risk factor for developing ischemic stroke. Their role in hemorrhagic stroke is not clear. The study aimed to evaluate the lipid profile levels and discharge outcomes of patients who were admitted to a tertiary hospital in Bangladesh and also to determine the difference in the lipid profile of patients with ischemic and hemorrhagic stroke.*

Materials and methods: *This retrospective analytical study included 65 hospitalized stroke patients from the Neurology Unit of Chittagong Medical College Hospital. Data regarding age, sex, risk factors of stroke, lipid profile [Total Cholesterol (TC) Triglyceride (TG) Low-Density Lipoprotein cholesterol (LDL-C), and High-Density Lipoprotein Cholesterol (HDL-C)] levels, and discharged outcomes [Favourable-modified Rankin Scale (mRS)score ≤2 and unfavourable-mRS >2] were extracted from the register and compared between ischemic and hemorrhagic stroke patients.*

Results: *Out of 65 patients, 55 (84.6%) had ischemic and 10 (15.4%) had hemorrhagic stroke. Hypertension (67.7%), smoking (50%), diabetes (40%), and family history of stroke (38.5%) were common risk factors. The most common lipid abnormality was high LDL-C (86.2%), followed by low HDL-C (63.1%), high TG (47.7%), and high TC (35.4%). There was no difference in the lipid profile ofischemic and hemorrhagic stroke patients. Forty-seven (72.3%) patients were in poor functional status during discharge and discharged outcome was not associated with admission lipid profile. Compared to patients with unfavorable outcomes, patients with favorable outcomes at discharge were significantly younger, had shorter durations of hospitalization, had lower mRS scores at admission*

Conclusion: *Dyslipidemia in the form of high LDL-C and low HDL-C were common in stroke patients be it infarct or hemorrhage. There was no difference in the lipid profile of the two categories of stroke.*

Key words : Hermorrhagic stroke; Ischemic stroke; Lipid profile.

INTRODUCTION

Stroke is one of the significant causes of mortality and disability all over the world.[1] Data from the World Health Organization in 2021 indicates that stroke accounts for 18.75% of total deaths keeping it at the top of the list of 'leading causes of death in Bangladesh,' which ranks mortality due to stroke in Bangladesh as number 41 in the world.[2] A majority of stroke survivors continue to live with disabilities, and the costs of ongoing rehabilitation and long-term care are undertaken by family members, which causes poverty.[3] Increasing burden of stroke in Bangladesh is primarily driven by demographic changes and enhanced by the increasing prevalence of the key modifiable risk factors.[4] Without the urgent implementation of effective primary prevention strategies, the stroke burden will probably continue to grow across the world, particularly in low to middle-income countries like Bangladesh.[1]

Therefore, effective risk factor intervention represents the most appropriate to reduce stroke morbidity and mortality. While some risk factors, such as hypertension and atrial fibrillation, have been recognized as independently related to stroke occurrence, the predictive role of lipid profile has not yet been well established, similar to that reported in myocardial infarction.[5-7] Dyslipidemia in the form of an increased level of TC, TG, LDL-C, and decreased HDL-C level is a risk factor for atherosclerosis and the main predictor of cardiovascular diseases including stroke.[8] Evidence of a causal relation between dyslipidemia and stroke is inconsistent. Most large-scale studies on cholesterol and stroke risk have not differentiated between ischemic and hemorrhagic stroke, nor did they differentiate among various subtypes of ischemic stroke.[7,9,10] Hospital-based small-scale studies were also inconsistent regarding the distribution of lipid profiles between ischemic and hemorrhagic stroke.[6,11-21]

Therefore, the role of lipids profiles in stroke status and risk assessment also needs to be discussed further to justify the use of lipid-lowering therapy. The present study was designed to evaluate the lipid profile levels of patients who had experienced an acute stroke during the first 24-hour and to compare these levels between patients with ischemic and hemorrhagic strokes. The study also assessed the influence of the admission lipid profile of stroke patients on their in-hospital outcomes.

MATERIALS AND METHODS

This retrospective analytical study was conducted in the Department of Neurology, Chittagong Medical College, Chattogram, Bangladesh, from January 1, 2022, to April 30, 2022. The Ethical Review Committee approved the study protocol of Chittagong Medical College. Informed consent was waived due to retrospective anonymous data collection and presentation.

The case notes of the patients admitted during the study period were reviewed from the ward register. Consecutively admitted newly diagnosed cases of stroke (Diagnosis of stroke was made based on findings from Neuroimaging-either of CT or MRI) presenting within 72 hours of symptom onset, with a complete record of lipid profile were included in the study. Subjects with acute stroke and focal neurological deficit lasting <24 hours, death within 24 hours of admission, past H/O stroke, primary sub-arachnoid hemorrhage, and the co-existing acute coronary syndrome were excluded from the study.

Demographic and clinical data were retrieved and recorded in a case record form, including age, sex, smoking, hypertension, and diabetes mellitus. Lipid profile estimation: the percentage of abnormal lipid value (TC> 200 mg/dl, TG > 150 mg/dl, LDL-C >100 mg/dl, and HDL-C <40 mg/dl was taken as abnormal according to NCEP ATP III.[22] In-hospital outcome was dichotomized based on discharged mRS score, mRS score ≤ 2 was considered as a favourable functional outcome and mRS score 3-6 was considered as an unfavourable functional outcome.[23]

Data were analyzed using SPSS version-23 software. Quantitative data were expressed as either mean and standard deviation or median (Interquartile range) and between groups differences were tested by either by Independent sample t-test or Mann-Whitney U test. Qualitative data were expressed as a percentage and compared between groups by Chi-square test. P value <0.05 was taken as statistical significance.

RESULTS

During the study period, total 65 cases were found to meet eligible criteria and included in the final analysis. Among them 55 (84.6%) had ischemic and 10 (15.4%) had hemorrhagic stroke. Table I shows that, mean age of the stroke patients was 56.6 years; the majority of patients (56.9%) were male. Hypertension, smoking, diabetes and family history of stroke were common risk factors identified at the time of admission. Though, male sex and hypertension were more common in hemorrhagic stroke and diabetes and positive family history were more common in ischemic stroke, none of the association was significant statistically (p>0.05).

Table I Clinical characteristics of the patients stratified by stroke type

Variables	Total (n=65)	Ischemic stroke (n=55)	Hemorrhagic stroke (n=10)	p value
Age, Years	56.6±15.7	55.6±15.7	62.8±15.1	0.180†
Male sex	37 (56.9)	30 (54.5)	7 (70.0)	0.365*
Current or Ex-smoker	33 (50.8)	28 (50.9)	5 (50.0)	0.961
Hypertension	44 (67.7)	35 (63.6)	9 (90.0)	0.101
Diabetes mellitus	26 (40.0)	24 (43.6)	2 (20.0)	0.160
Alcohol habit	4 (6.2)	3 (5.5)	1 (10.0)	0.582
F/H of stroke	25 (38.5)	22 (40.0)	3 (30.0)	0.550

Data were expressed as either frequency (%) or mean±SD. †Independent sample t test, *Chi-square test.

In the present study, the most common lipid abnormality was high LDL-C (86.2%), followed by low HDL-C (63.1%) high TG (47.7%) and high TC (35.4%). TC was abnormal in 38.2% of ischemic stroke and 20% of hemorrhagic stroke. LDL-C was abnormal in 74.5% of ischemic stroke and 50% of hemorrhagic stroke. Abnormal TG was observed respectively in, 52.7% and 20% of the patients with ischemic and hemorrhagic stroke. Low HDL-C was observed respectively in, 65.5% and 50% of the patients with ischemic and hemorrhagic stroke (Table II). However, Table II depicted that, none of the mean differences between ischemic and hemorrhagic stroke and none of the association between abnormal lipid and stroke type were significant statistically.

Table II Lipid profile of the patients stratified by stroke type

Variables	Total (n=65)	Ischemic stroke (n=55)	Hemorrhagic stroke (n=10)	p value
TC, mg/dl	196.2±39.2	198.7±41.3	182.1±21.7	0.220†
TG, mg/dl	150.8±60.4	156.9±61.3	117.3±44.9	0.056†
LDL-C, mg/dl	127.3±36.6	127.1±38.2	128.4±28.2	0.919†
HDL-C, mg/dl	38.4±9.7	37.8±9.7	41.6±9.6	0.265†
TC >200mg/dl	23 (35.4)	21 (38.2)	2 (20.0)	0.269*
TG >150mg/dl	31 (47.7)	29 (52.7)	2 (20.0)	0.057*
LDL-C >100 mg/dl	56 (86.2)	41 (74.5)	5 (50.0)	0.056*
HDL-C <40 mg/dl	41 (63.1)	36 (65.5)	5 (50.0)	0.352*

Data were expressed as either frequency (%) or mean±SD. †Independent sample t test, *Chi-square test.

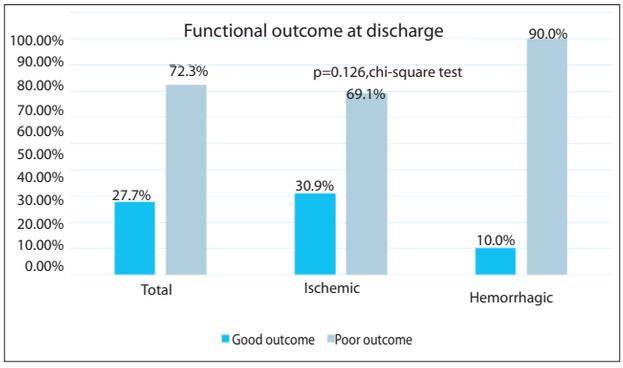

Figure 1 Functional outcome of the patients during discharge stratified by stroke type

Figure 1 shows that, during discharge near about three-fourth (72.3%) of the patients were in poor functional status. Proportion of patients with poor functional status was higher in patients with hemorrhagic stroke than patients with ischemic stroke (90% versus 69.1%) without any statistical significance (p=0.126).

Compared to patients with unfavorable outcomes, patients with favorable outcomes at discharge were significantly younger, had shorter durations of hospitalization, had lower mRS scores at admission (Table III). On the other hand, sex, risk factors of stroke including abnormal lipid profile had no significant association with discharge outcome.

Table III Factors associated with poor functional status assessed by mRS score at discharge

Variables	Favourable outcome (n=18)	Unfavorable outcome (n=47)	p value
Age, Years	47.0±15.5	60.1±14.2	0.002†
Male sex	11(61.1)	26 (55.3)	0.673*
Hemorrhagic stroke	1 (5.6)	9 (19.1)	0.174*
Current or Ex-smoker	8 (44.4)	25 (53.2)	0.528*
Hypertension	10 (55.6)	34 (72.3)	0.195*
Diabetes mellitus	7 (38.9)	19 (40.4)	0.910*
Alcohol habit	3 (16.7)	1 (2.1)	0.061*
F/H of stroke	9 (50.0)	16 (34.0)	0.237*
TC >200mg/dl	5 (27.8)	18 (38.3)	0.427*
TG >150mg/dl	6 (33.3)	25 (53.2)	0.151*
LDL-C >100 mg/dl	14 (77.8)	42 (89.4)	0.226*
HDL-C <40 mg/dl	8 (44.4)	33 (70.2)	0.054*
Admission mRS	3 (2-3)	4 (4-4)	<0.001‡
Length of stay, days	3.5 (1.0-4.3)	5.0 (4.0-7.0)	<0.001

Data were expressed as either frequency (%) mean±SD or median (Interquartile range). †Independent sample t test, *Chi-square test, ‡Mann-Whitney U test.

DISCUSSION

In the current study, clinical characteristics, lipid profile status and discharge outcome were assessed in 65 stroke patients admitted to a neurology unit of a tertiary level hospital of Southeastern Bangladesh. The study demonstrated that none of the lipid parameters had a significant to stroke subtype and discharge outcome.

Mean age of the stroke patients which is around 57 years is consistent with findings from previous report from Bangladesh.[24] The lower percentage of female stroke patients in the current study and previous study implies either a low prevalence of stroke among females or a lower access of female stroke patients to the tertiary care hospital.[24] Hypertension (67.7%) smoking (50%) diabetes (40%), and family history of stroke (38.5%) were common risk factors identified at the time of admission and the prevalence were consistent with the earlier reports from Bangladesh.[6,13,24] Most of the stroke patients of the current study had dyslipidemia, the most common lipid abnormality was high LDL-C (86.2%), followed by low HDL-C (63.1%), high TG (47.7%) and high TC (35.4%). Dyslipidemia was a highly prevalent risk factors in Bangladeshi stroke patients irrespective of the stroke type.[6,13, 24] The current study failed to demonstrate any significant difference in the mean lipid profile levels between ischemic and hemorrhagic stroke patients. Similarly, none of the association between abnormal lipid levels and stroke type was significant statistically. Previous studies were inconsistent regarding the association of dyslipidemia and stroke subtype. The present study findings were agreed to the study of Habibi-koolaee etal. Dey et al. Graceet al. Togha et al. lipid profile levels were similar between patients with ischemic and hemorrhagic stroke.[11,13,15,21] On the contrary, Saadatnia et al observed that patients with hemorrhagic stroke have higher HDL-C and LDL-C levels and lower TG than ischemic stroke.[12] Mahmood et al observed that ischaemic stroke patients had high serum TC and lower HDL-C levels as compared to hemorrhagic stroke.[14] Rai et al observed that

patients with ischemic stroke had significantly higher proportion of high TC, TG, and LDL-C than ischemic stroke patients.[18]

Moreover, in the current study, admission lipid profile had no association with the discharged outcome of the of the stroke patients. Compared to patients with unfavorable outcomes, patients with favorable outcomes at discharge were significantly younger, had shorter durations of hospitalization, had lower mRS scores at admission. The present study confirmed the results of Abanto et al who observed that favorable outcome after stroke was independently associated with younger age, less severe stroke at admission and less duration of hospital stay.[25]

LIMITATIONS

Several limitations are notable like, small sample size, sample collected from a referral hospital and retrospective design. So, study results might not be generalizable to the overall stroke patients of Bangladesh.

CONCLUSIONS

Dyslipidemia in the form of high LDL-C and low HDL-C were common in stroke patients be it infarct or hemorrhage. There was no difference in the lipid profile of the two categories of stroke. Admission lipid profile status had no association with the discharge outcome of the stroke patients.

RECOMMENDATIONS

High risk patients of stroke may be screened using serum lipid profile and further studies are suggested to evaluate the effect of lipid lowering therapy in terms of morbidity and mortality in stroke patients.

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DISCLOSURE

All the authors declared no conflict of interest.

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