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Original Research Article

TO DETERMINE THE LEVELS OF GOOD CHOLESTEROL-HDL IN THE PATIENTS HAVING ISCHEMIC STROKE AND DISEASE OUTCOME IN NEXT 2 WEEKS

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Abstract: *To know about the levels of good cholesterol-HDL in ischemic stroke patients and disease outcomes in the next 2 weeks. This study was carried out from July 2021 to Jan 2022 at the Department of Medicine Divisional Teaching Hospital Mir Pur Azad Jammu and Kashmir. Inclusion criteria were any patient aged between > 20 years old, both males and females admitted with sudden onset of focal neurological deficit. They diagnosed the CT brain as an ischemic stroke less than 24 hours old.HDL-C levels immediately after admission before starting aspirin and statins. The patient's functional outcome was assessed by using the ADL scale at 2 weeks. The data collected was evaluated on SPSS. A total of 150 patients were included in the study. The mean age of patients was 60.16 + 1.35 years. There were 85 (68%) males and 40 (32%) females. One hundred-five patients (84%) had serum HDL-C levels less than the appropriate range, and 20 (16%) had serum HDL-C levels within the appropriate range. Patients with high HDL-C levels show statistically significant better functional outcomes (p-value 0.001). We conclude that high serum HDL-C levels are strongly associated with better functional outcomes 2 weeks after stroke, and patients with high HDL-C levels are at reduced risk of developing stroke.*

Keywords: Cholesterol, Dyslipidemia, HDL-C, Stroke

Introduction

Stroke is defined as the abrupt onset of neurologic insufficiency secondary to loss of blood supply to the brain (Xiong et al., 2022). It is the second most common cause of death, which causes major disability, and almost one-sixth of the survivors remain permanently disabled (Kainz et al., 2021). Stroke in the coming years will burden countries' health systems, and this situation will worsen due to the aging population and sedentary lifestyle (Basri et al., 2021). Stroke may be hemorrhagic or ischemic depending upon the cause, with ischemic stroke accounting as a major subtype involving 55-90% of patients as reported in the literature (Zhao et al., 2018). Mostly, neurologic deficit occurs in patients after ischemic stroke secondary to some thromboembolic event (Rizzo et al., 2022).

Dyslipidemia is the presence of high levels of "bad fats" like low-density lipoproteins (LDL), very low-density lipoproteins (VLDL), triglycerides (TG), and low levels of "good fats" like high-density lipoproteins (HDL) in the blood is a well-established risk factor of stroke (Jacob et al., 2022). Dyslipidemia impairs smooth muscle function and damages cerebral artery endothelium, leading to atherosclerosis and stroke (Gopinath et al., 2021). The Apo lipoproteins B (LDL, IDL) promotes atherosclerosis by promoting inflammation, thus making a patient more susceptible to cerebrovascular event, and Apo lipoproteins A (HDL) have protective properties by moving cholesterol from blood to liver and decreases platelets aggregation (Cho, 2022). So, the lipogenic index i-e apo B/ apo A-I ratio is a good predictor of patients at risk of some cerebrovascular accident/stroke (Ginsberg et al., 2021). A study by Rana JS et al., 2015) suggested that patients with low HDL-C and high total cholesterol (TC) risk developing cardiovascular or cerebrovascular diseases.

Much data is available on dyslipidemias and their association with cerebrovascular diseases, but very little data is available, particularly on HDL-C levels in blood with patient outcomes. The present study aimed to know about the levels of good cholesterol-HDL in the patients having ischemic stroke and disease outcomes in the next 2 weeks in our population.

Methodology

This study was carried out from July 2021 to Jan 2022 at the Department of Medicine Divisional Teaching Hospital Mir Pur Azad Jammu and Kashmir. Before conducting the study, the hospital ethical committee obtained formal ethical approval. We calculated the sample magnitude using the WHO calculator by keeping a 95% confidence level, 5 % margin of error, and mean Barthel index at baseline versus 2 weeks after admission, i-e 36.4 + 28.5 vs. 68.9 + 27.7 (Pan et al., 2010). The sample size came out to be 150 after keeping the before-mentioned standards. Inclusion criteria were any patient aged between > 20 years old, both males and females admitted with sudden onset of focal neurological deficit and diagnosed on CT brain as ischemic stroke less than 24 hours old. Exclusion criteria were

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pregnancy, second-time stroke, and patients having any cardiac event in the last 6 months. A written informed consent was taken before including the patients. Non-probability uninterrupted sampling practice was used to include the patients. 5cc of each patient's blood was taken and sent for HDL-C levels immediately after admission before starting aspirin and statins. Blood samples were sent to the Divisional Headquarters Teaching Hospital Mir Pur Azad Jammu and Kashmir Pathology Laboratory. After 2 weeks, the patient's functional status was evaluated using activities of daily living on a five-point scale. This five-point scale has stages i-e stage I: no disability, stage II: mild disability, stage III: moderate disability, stage IV: severe disability, and stage V: dead patient (Dias et al., 2019).
The information collected was evaluated in SPSS 24.0. Patients' ages were expressed as Mean ± SD, and gender and other comorbidities were summarized as frequency and percentages. Student t-test and univariate logistic regression analysis were applied to determine the correlation between ADL assessed and HDL-C levels.

Results

One hundred fifty patients with acute ischemic stroke were incorporated who met the inclusion criteria. Fifteen patients had died, and 10 lost the follow-up, so they were omitted. The mean age of patients was 60.16 ± 1.35 years. There were 85 (68%) males and 40 (32%) females.77 (61.6%) patients had a smoking history, and 55 (44%) patients had a history of hypertension. 59 (47.2%) patients had diabetes mellitus at presentation. Demographics are mentioned in Table I.

Table- I. Demographics of patients

Variable		**n (%)**
No of patients		125
Age (years)		60.16± 1.35
Gender	Male	85 (68%)
	Female	40 (32%)
Diabetes Mellitus		59 (47.2%)
Hypertension		55 (44%)
Smoking		77 (61.6%)
HDL-C levels	< 1 mmol/L	105 (84%)
	> 1 mmol/L	20(16%)
Activities of daily living (ADL)	Stage I	13 (10.4%)
	Stage II	20 (16%)
	Stage III	72 (57.6%)
	Stage IV	12 (9.6%)
	Stage V	8 (6.4%)

One hundred-five patients (84%) had serum HDL-C levels less than the appropriate range, and 20 (16%) had serum HDL-C within the appropriate range. Based on HDL-C levels, two groups were made. Group A contains patients with serum HDL-C levels < 1mmol/L and group B had patients with serum HDL-C levels > 1mmol/L. The mean age in group A was 62.10 ± 15.4, and in group B, the mean age was 59.79 ± 13.27, which was not statistically significant. When different stages of ADL were compared in both groups, it was seen that most patients of group B fell in the early stages and had better outcomes when compared with those with low HDL-C levels, in which the outcome was poor, which was statistically significant (p-value 0.001). Diabetes mellitus, hypertension, and smoking were insignificant when compared in both groups. Comparisons of different variables in both groups with their p values are mentioned in Table II.

Table II: Comparison of variables in both groups

Variables		**Group A (HDL-C levels < 1 mmol/L)**	**Group B (HDL-C levels > 1 mmol/L)**	**P-value**
Age (years)		62.10± 15.4	59.79± 13.27	0.40
Gender	Males	68 (80%)	17 (20%)	0.07
	females	37 (92.5%)	3 (7.5%)	
Hypertension		45 (81.8%)	10 (18.2%)	0.73
Diabetes Mellitus		47(71.7%)	12(28.3%)	0.21
Activities of daily living (ADL)	Stage I	8 (61.5%)	5 (38.5%)	0.001
	Stage II	11 (55%)	9 (45%)	
	Stage III	67 (93.1%)	5 (6.9 %)	
	Stage IV	11 (91.7%)	1 (8.3%)	
	Stage V	8 (100%)	-	

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Discussion

Stroke or cerebrovascular accident is a costly disease affecting families worldwide, impacting patients and their families' social lives. Higher triglyceride and low HDL-C content are documented risk factors for ischemic stroke (Deng et al., 2018). Statin therapy, given nowadays, is primarily aimed at reducing LDL-C levels in the blood to reduce the risk of stroke and cardiovascular events (Mortensen and Nordestgaard, 2020). Some studies report that high TG and low HDL-C levels, named "atherogenic dyslipidemia," are a clinical marker of the at-risk population (Hoshino et al., 2022). As the prognostic roles of HDL-C on stroke vary with hemorrhagic stroke and various subtypes of ischemic stroke (Yang et al., 2022), it is better to explore the association between HDL-C levels and stroke outcome. In our study, out of a total of 125 included patients, 105 patients (84%) had serum HDL-C levels less than the required range, and 20 (16%) patients had serum HDL-C levels within the required range, which shows that mainly patients ischemic stroke have low contents of serum HDL-C in their blood. Results shared by Ryu et al., 2016 showed that patients with higher content of HDL-C in their blood are less likely to have a neurological deficit when compared with patients having low HDL-C in their blood (p-value 0.12). Kurth et al., 2007 also reported in their study that females with raised levels of HDL-C in their blood are less likely to have ischemic stroke than women with low levels of HDL-C in their blood (P value 0.001).

Our study showed that patients with high HDL-C levels had better functional outcomes at 2 weeks than those with low levels (P value 0.001). A study by Vauthey et al., 2000 also showed similar results: high cholesterol levels in stroke patients were strongly associated with better functional outcomes after 4 weeks of stroke. Markaki et al., 2014 also reported in their study that better functional outcome was seen in patients with high levels of cholesterol in their blood compared to those with low levels of HDL-C. A study by Deng QW et al. also stated that raised contents of HDL-C are related to better functional outcomes and better survival rates than patients with low HDL-C levels (Deng et al., 2018).

This study's limitation is that only HDL-C levels of patients were studied and compared with functional outcomes. In the next studies, the whole lipid profile and the ratio of Total glycerides with HDL-C may be compared with functional outcome. Also, the long-term functional outcome may be observed in the next studies.

Conclusion

We conclude that high serum HDL-C levels are strongly associated with better functional outcomes 2 weeks after stroke, and patients with high HDL-C levels are at reduced risk of developing stroke.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Not applicable
Consent for publication
Not applicable
Funding
Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

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