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FREQUENCY OF DYSLIPIDEMIA IN STROKE PATIENTS ADMITTED IN MEDICINE WARDS OF CMH LAHORE

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Abstract

Objective: *The purpose of the research was to find frequency of dyslipidaemia in stroke patients admitted in medicine wards of CMH Lahore*

Study Design: *Cross Sectional observational study*

Study Duration: *06 months from December 2024 to May 2025*

Study Place: *Department of Medicine, CMH Lahore*

Methods: *160 confirmed stroke patients were recruited to assess dyslipidemia prevalence using NCEP-ATP III criteria. Fasting lipid profiles were analyzed, and demographic and clinical data were recorded, with statistical analysis done using SPSS 26. P value <.05 was considered significant.*

Results: *160 stroke patients were included, with average age being 61.8 years old. There were 98 males (61.3%) patients and 62 females (38.7%). 73.1% patients were found to have ischemic stroke and 26.9% patients experienced hemorrhagic stroke. Dyslipidemia was mainly associated with ischemic stroke i.e 65% population, and elevated LDL-C being the most frequent abnormality.*

Conclusion: *Dyslipidemia is highly prevailing in stroke patients, especially in ischemic stroke. Common abnormalities include high LDL-C, high triglycerides, and low HDL-C. Regular lipid screening and aggressive management are essential for efficacious stroke prevention and risk reduction.*

INTRODUCTION

Stroke is a major cause of death and disability in the world and a significant and increasing public-health problem in Pakistan. The epidemiological estimates show that a high and increasing burden of cerebrovascular disease in the country with a significant proportion of adult mortality and long-term disability due to stroke. Stroke risk factors are multifactorial, with dyslipidemia, i.e., the abnormality of serum lipid levels e.g., high total cholesterol, low-density lipoprotein cholesterol (LDL-C), and triglycerides, or low levels of high-density lipoprotein cholesterol (HDL-C), remaining consistently linked with the elevation of risk in ischemic cerebrovascular events and poor vascular outcomes. Dyslipidemia in cerebrovascular patients is thus of prognostic

and therapeutic significance when identified and dealt with early.[1]According to local data in tertiary care centres, there is a high-level of lipid abnormality among stroke presenting patients in Pakistan. A number of cross-sectional and hospital-based studies had reported that a significant percentage of ischemic stroke admissions have disordered lipid profiles with reported percentages depending on the region, type of stroke and diagnostic limits applied. These articles also consider shared comorbid vascular risk factors that exist in stroke patients - in particular hypertension, diabetes mellitus and smoking that deal with dyslipidemia to enhance cerebrovascular risk. The presence of local dyslipidemic burden of stroke in the groups of the population highlights the possibility of secondary prevention via lipid-lowering treatment (such as statins), risk factor intervention and follow-up in the in-patient and out-patient environment.[2] Although the clinical implications are high, there is a variation in the reported rates and no published sources that specifically addressed the nature and extent of dyslipidemia in stroke patients admitted in military-operated tertiary care hospitals like the Combined Military Hospital (CMH), Lahore. CMH Lahore has a heterogeneous urban and peri-urban population, and offers a convenient environment to study the patterns of lipid profile prevalence and patterns of stroke admissions to the medicine wards. The measurement of the prevalence of dyslipidemia in this group will inform local practice through the determination of the fraction of patients in whom lipid treatment can be recommended, in-hospital screening guidelines, and focused secondary prevention interventions.

This research will thus aim at establishing the rate and trend of dyslipidemia amongst stroke patients admitted under the medicine wards at CMH Lahore, as well as contextualize the results within the current national literature to assist clinicians and policy makers in maximizing the stroke secondary prevention in Pakistan.

Methodology:

A cross-sectional descriptive study was carried out at the Department of Medicine of Combined Military Hospital (CMH) Lahore, which is a tertiary care referral hospital that serves both the military and the civilian population. The hospital has a high stroke population per year and it would be a suitable place to undertake the analysis of the burden of dyslipidemia in cerebrovascular patients. The research was conducted in six months, in the months between December 2024 and May 2025. Data collection began after receiving the IRB consent of CMH Lahore. The confidentiality of patients was highly observed, and it was voluntary. All the adult patients who were admitted with a clinical and radiological diagnosis of stroke made up the study population. Stroke was referred to as per the WHO criteria as the sudden-onset indicators of focal or general impairment of cerebral function that last longer than 24 hours without an apparent cause other than vascular origin.[3] Ischemic and hemorrhagic stroke patients were involved. The sample size of 160 patients was determined through the WHO sample size formula whereby the expected prevalence of dyslipidemia in other local studies, the confidence level of 95% and a margin of error of 5% were used. The sampling method adopted was a non-probability consecutive. All stroke patients fitted with the study were enrolled within the study time until the required sample size was reached.

Inclusion Criteria

1. Patients aged ≥ 18 years.
2. Stroke established by CT scan or MRI brain.
3. Within 72 hours of the onset of the symptoms, admission to the medicine wards is required.
4. Patients (or attendants) who signed the informed consent written.

Exclusion Criteria

1. Patients which experience chronic liver disease, nephrotic syndrome, hypothyroidism, or other diseases that interfere with the metabolism of lipids.

2. Patients in a critical state or in unconscious conditions and have no attendants to give consent.
3. Temporary ischemic attacks (TIA).

Demographic and clinical data were entered using a structured proforma after the written informed consent. These were the age, sex, type of stroke, comorbidity, smoking, and family history of cardiovascular diseases. The fasting blood was done to all patients within 24 hours of admission.The 12-hour fasting venous blood sample used was picked and it was tested at CMH Lahore pathology laboratory on an automated chemistry analyzer. The measurements were made of the following parameters:

1. Total Cholesterol (TC)
2. Low-Density lipoprotein cholesterol (LDL-C)
3. High-Density lipoprotein cholesterol (HDL-C)
4. Triglycerides (TG)

Dyslipidemia had the criteria of National Cholesterol Education Program-Adult Treatment Panel III (NCEP-ATP III):[4]

1. TC ≥ 200 mg/dL
2. LDL-C ≥ 130 mg/dL
3. HDL-C < 40 mg/dL (men) or < 50 mg/dL (women)
4. TG ≥ 150 mg/dL

Any form of abnormality was considered dyslipidemia.

The data were entered and analyzed by means of SPSS version 26. The numerical variables (age, lipid levels) were illustrated as mean + standard deviation (SD), whereas qualitative variables (gender, stroke type, dyslipidemia frequency, etc.) were represented as frequencies and percentages. The most significant effect was the prevalence of dyslipidemia in stroke patients. The subgroup analysis was done based on stroke type, gender and age. The p-value was taken as significant below 0.05.

RESULTS:

The number of stroke patients enrolled throughout the study was 160 in accordance with the inclusion criteria. The average age of the research population was 61.8 years old in comparison with 11.4 years old with the range of ages being 32-92 years. There were 98 males (61.3%) patients and 62 females (38.7%), which provided the male to female ratio of about 1.6:1. The majority of the patients were between 56 and 75 years of age (n = 89, 55.6%).

Out of the entire patients (n=160), 117 (73.1%) patients were found to have ischemic stroke and 43 (26.9%) patients experienced hemorrhagic stroke. Male was more likely to be affected by ischemic stroke (n = 74, 63.2%), but there was no significant gender difference in hemorrhagic stroke.

Of all the enrolled patients 104 (65%) were found to have dyslipidemia using the NCEP-ATP III criteria. Dyslipidemia was more common in ischemic stroke patients (n = 84, 71.8%) than in hemorrhagic stroke patients (n = 20, 46.5%). This was statistically significant ($p < 0.05$), which means that lipid abnormalities were more definitely associated to be associated with ischemic events.

The occurrence of certain lipid abnormalities is summarized below:

a. Elevated LDL-C (≥130 mg/dL): 78 patients (48.7%)
b. Low HDL-C (under 40 mg/dl in men, under 50mg/dl in women): 66 patients (41.3%)
c. Higher Total Cholesterol (>200 mg/dl): 59 (36.8%) patients.
d. High Triglycerides (150 or above)/dl: 73 (45.6%) patients.

Low HDL-C was more prevalent in males but high total cholesterol was a little more prevalent in females. The most common of all lipid abnormalities was increased LDL-C with hypertriglyceridemia coming next.

Ischemic Stroke (n = 117):

a. Elevated LDL-C: 62 (53%)
b. Elevated TG: 55 (47%)
c. Low HDL-C: 52 (44%)
d. Elevated TC: 46 (39%)

Hemorrhagic Stroke (n = 43):

a. Elevated LDL-C: 16 (37%)
b. Elevated TG: 18 (42%)
c. Low HDL-C: 14 (32%)
d. Elevated TC: 13 (30%)
e. The lipid derangements in cases of ischemic stroke were always greater than the hypertriglyceridemia in cases of hemorrhagic stroke, but the difference in hypertriglyceridemia was not as big.
f. One hundred and eighty-eight patients (73.8%), 56 (35%), and 61 (38.1%) had hypertension, diabetes mellitus, and smoking history, respectively. Patients with several comorbid conditions were more common to have dyslipidemia.
g. Dyslipidemia in patients with hypertension: 82 (69.5%)Many of these diabetic patients have dyslipidemia: 42 (75.0%)Dyslipidemia among smokers: 45 (73.7%)
h. Lipid abnormalities were most common among patients with hypertension and diabetes.

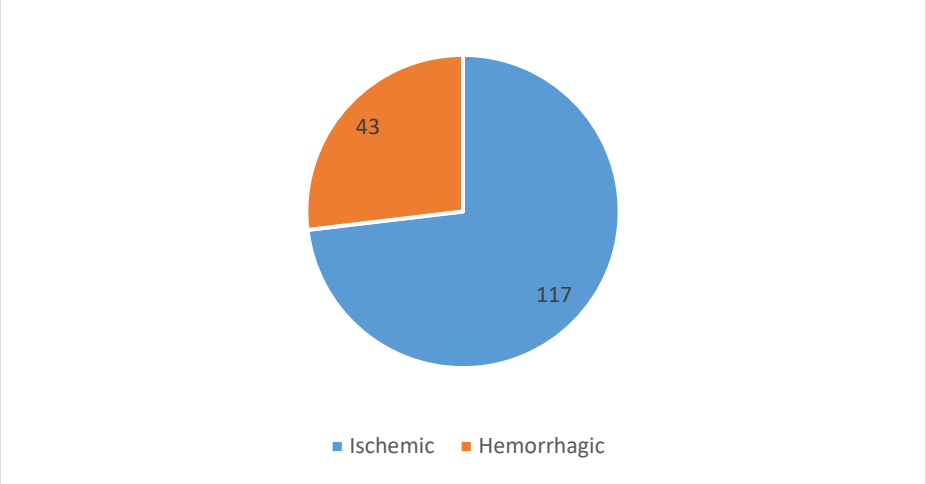
The prevalence of dyslipidemia was significantly high (n = 72, 71.3%) in patients older than 60 years compared to younger patients ($p < 0.05$). Even though the rate of dyslipidemia was slightly higher in males (67.3%) than in females (61.3%), the difference was not statistically significant.

Summary of Key Findings:

The analysis has established that dyslipidemia was found in a high proportion (65%) in patients who were admitted at CMH Lahore because of stroke. Ischemic stroke was found to be much more dyslipidemic and high LDL-C levels turned out to be the most widespread lipid abnormality. The results highlight the need to have regular check-ups of lipid levels and prompt management of stroke patients to minimize the risk of recurrence.

Variable	**n** (%)
Age (years)	61.8 ± 11.4
Gender	
• **Male**	**98 (61.3%)**
• **Female**	**62 (38.7%)**
Age Groups (years)	
• **32–55**	**41 (25.6%)**
• **56–75**	**89 (55.6%)**
• **>75**	**30 (18.8%)**

Table 1: Demographic Data of the Study Population (n = 160)



Pie chart 1: Distribution of Stroke Types

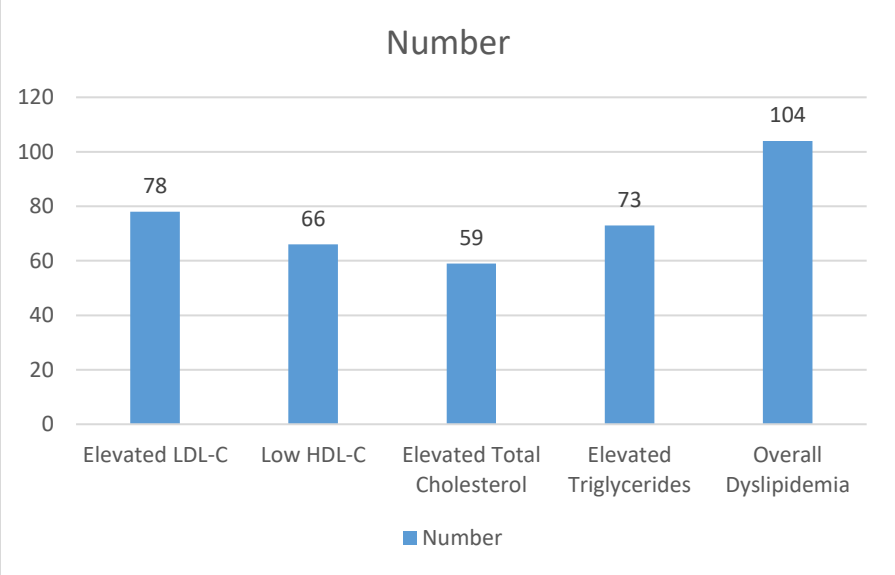


Chart 1: Overall Prevalence of Dyslipidemia and Lipid Abnormalities

Lipid Abnormality	Ischemic Stroke	Hemorrhagic Stroke
Elevated LDL-C	62 (53%)	16 (37%)
Elevated Triglycerides	55 (47%)	18 (42%)
Low HDL-C	52 (44%)	14 (32%)
Elevated Total Cholesterol	46 (39%)	13 (30%)

Table 2: Comparison of Lipid Abnormalities Between Ischemic and Hemorrhagic Stroke

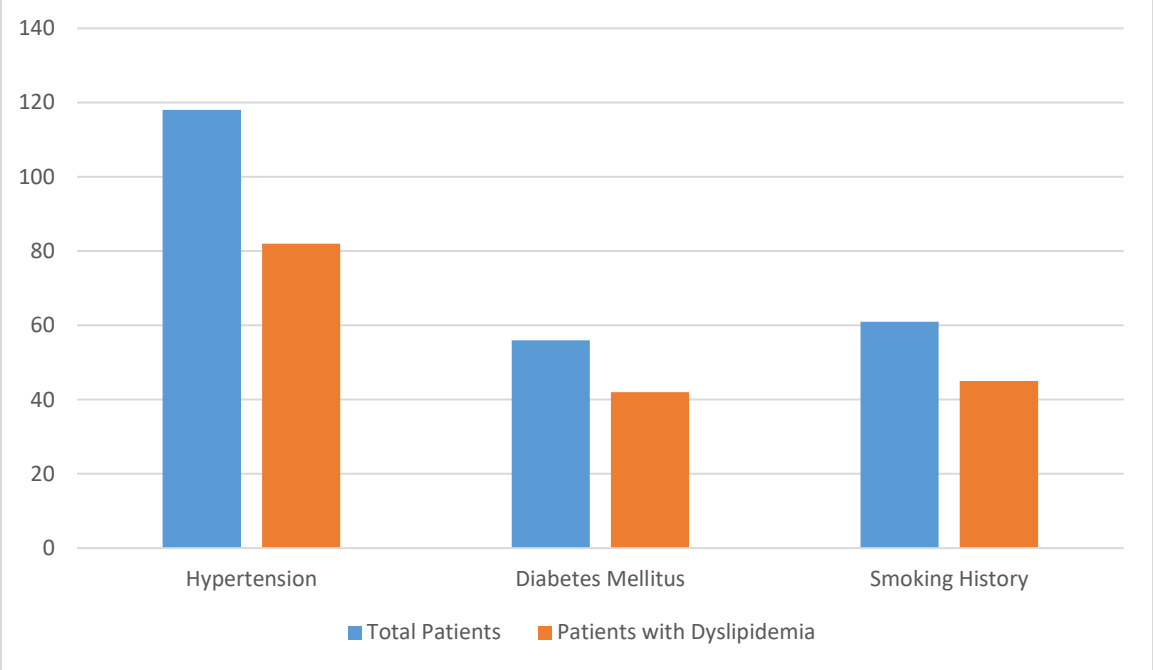


Chart 2: Frequency of Comorbidities and Their Association with Dyslipidemia

Discussion:

The current research evaluated the trends and occurrence of dyslipidemia in 160 patients of stroke admitted in medicine wards and revealed that the condition had a high burden especially in those with ischemic stroke. The general prevalence of dyslipidemia in the study population was found to be 65% which is quite consistent with the already reported studies[5] in the region that recorded dyslipidemia between 55 and 75 percent prevalence among stroke patients, especially the ischemic stroke. The demographic analysis on the study population revealed that there was a male dominance with 61.3 percent of the subjects being male and the mean age of the study population was about 62 years. This age distribution is in line with available epidemiological trends[6] that mean that the prevalence of stroke is higher in older age, and that more individuals in older age groups are prone to stroke because of the accumulated exposure to vascular risks. Out of the 160 patients, 73.1% had ischemic stroke, and 26.9% had hemorrhagic stroke. This prevalence is congruous with the data in the rest of the world, where ischemic strokes constitute approximately 80-85 percent of all stroke incidences,[7] and a statistically significant relationship exists between dyslipidemia and ischemic stroke patients ($p < 0.05$). The findings confirm the longstanding hypothesis of lipid abnormalities, specifically increased LDL-C and decreased HDL-C, in the pathogenesis of an atherosclerotic plaque and resultant cerebral stroke.[8]High LDL-C was the most frequent lipid abnormality in the present study since it was present in 48.7% of the total patients and 53% of ischemic stroke patients. LDL-C is a key facilitator of atherosclerosis and an excessively high level was observed in 45.6 percent of patients and was comparatively equivalent in both ischemic and haemorrhagic subtypes, albeit a little greater in patients with an ischemic stroke. This is consistent with new findings that triglycerides play a role in the risk of ischemic stroke by causing endothelial dysfunction and pro-inflammatory mechanisms.[9] 41.3% of patients had low HDL-C and the majority of subjects were male. It was considered that low HDL-C was an independent risk factor of ischemic stroke because of its anti-inflammatory and antioxidant properties, as well as reverse cholesterol transport. Low HDL-C, particularly in women was more frequently observed as a risk factor in 36.8% of the patients,

yet LDL and triglycerides associated more with ischemic stroke. Comparison between ischemic and hemorrhagic stroke subgroups further indicated that all forms of lipid abnormalities (LDL-C, HDL-C, triglycerides, and total cholesterol) were found to be more frequent in ischemic patients. These results are highly indicative that dyslipidemia is more significant as an etiological factor in ischemic stroke than in hemorrhagic stroke, as has been long known.[10]

It was also established in the study that there was strong relationship between dyslipidemia and frequent comorbidities in the vascular context. Hypertension patients recorded high prevalence of dyslipidemia (69.5%), which is in line with literature which has indicated that the two conditions are often comorbid and work synergistically to accelerate atherosclerosis.[11] Diabetic dyslipidemia is typified by hypertriglyceridemia and low levels of HDL-C and both were prevalent in our sample. The combination of diabetes and dyslipidemia together is a significant risk factor of ischemic stroke in a smoker (73.7%).[12] Diabetes is also a risk factor because of the combination of smoking with the unbalanced lipid condition and vascular dysfunction. Dyslipidemia was strongly related to age and 71.3% of adults aged above 60 years were affected. This is the increase in age that has been heavily recorded and represents the accumulated metabolic and vascular harm over the years, although the difference was non-significant as was evidenced by several other studies.[13]

The results have significant clinical and population health implications. The first is that they emphasize the need to conduct regular lipid screenings in all stroke patients as well as high-risk people before they experience stroke. Second, the findings promote guideline recommendations that early and aggressive lipid-lowering therapy, especially statins, should be administered to ischemic stroke patients to prevent the secondary stroke. Clinical trials conducted to date, including SPARCL, have shown up to 16 percent decreased recurrent stroke with high-dose statin therapy.[14] 3rd, dyslipidemia has an overwhelming association with hypertension, diabetes, and smoking, which points to the necessity of risk-factor management issues and not individual parameter treatment.

This frequency of dyslipidemia is quite high and in agreement with the numerous national studies performed in Pakistan also, lipid abnormalities are among the most common and also manipulative major risk factors of stroke. As an example, a study in Karachi by Kamal et al. found dyslipidemia in 68 percent of patients with an ischemic stroke, which indeed is similar to our results of 71.8 percent among ischemic stroke cases. Another study in Lahore revealed that the most common derangements in patients with an ischemic stroke are elevated LDL-C and low HDL-C which is equally similar to our results wherein elevated LDL-C was the most common derangement.[15,16]

On the same note, a number of global investigations also attest to the strong relationship between dyslipidemia and ischemic stroke. The case-control study, INTERSTROKE, a landmark study of 22 countries worldwide, has identified dyslipidemia to be among the top five risk factors of stroke, and the study revealed a strong dose-response relationship among all ethnicities and regions.[17]

The neighboring South Asian countries have been studied and similar trends are experienced. An Indian study (Nagaraja et al.) reported dyslipidemia in 62% of ischemic stroke patients, and LDL-c and triglycerides were the most commonly elevated lipid components, fanning our finding of high levels of low HDL-C in ischemic stroke patients. The consistency in findings among Pakistan, India, and Bangladesh indicated a possible regional trend of atherogenic dyslipidemia in South Asians. Outside South Asia, western research also adds on the role of lipid abnormalities in increasing stroke risk. In the Northern Manhattan Stroke Study it was reported that high levels of total cholesterol and LDL-C were independent risk factors associated with an increased risk of ischemic stroke and was found in younger adults, and was more strongly associated with ischemic than hemorrhagic stroke. A Canadian study found dyslipidemia to be underrecognized though significant risk factor of stroke and particularly in combination with low HDL-C- also present in our cohort.[18,19]
The trend of lipid abnormalities in our study is also similar to those in Middle East and East Asia. An Iranian study demonstrated high levels of LDL-C in 49 per cent of stroke cases and low levels of HDL in 39 per cent, which are high enough to reflect our results, with higher rates in ischemic stroke as compared to hemorrhagic stroke, and signify the biological plausibility of dyslipidemia as a universal risk factor.[20]

Limitation:
The research was done in one tertiary care hospital and this could be a limitation to the generalizability of the findings to the general population. The cross-sectional research study does not allow it to determine causal links between dyslipidemia and stroke sub types. There was also no evaluation of dietary factors, history of medication, and physical activity levels. To generalize results, a more comprehensive study with more sample size and data is required.

Conclusion:
This study shows that the prevalence of dyslipidemia is high in patients with stroke with much higher prevalence in ischemic stroke than hemorrhagic stroke. The most prevalent lipid abnormalities were elevated LDL-C, hypertriglyceridemia, and low HDL-C. The close relationship between dyslipidemia and major risk factors of vascularity, especially hypertension, diabetes mellitus, and smoking, adds more weight to the cumulative impact of metabolic imbalances in enhancing the speed of cerebrovascular disease. These results highlight the critical role of regular screening and prompt treatment of dyslipidemia to decrease the morbidity of stroke particularly in people with high risks. Timely introduction of lipid-lowering treatment, lifestyle change and combined risk-factor management should be part and parcel of primary and secondary stroke prevention measures.

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