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FREQUENCY OF DYSLIPIDEMIA AMONG STROKE PATIENTS PRESENTING AT TERTIARY CARE HOSPITAL

Original Research

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ABSTRACT

Background: Stroke remains one of the leading causes of mortality and long-term disability worldwide. Dyslipidemia is a recognized modifiable risk factor contributing to atherosclerosis and ischemic events. However, its frequency and distribution among different stroke subtypes remain variably reported in different populations.

Objective: To determine the frequency of dyslipidemia among patients presenting with stroke to a tertiary care hospital and assess its distribution across ischemic and hemorrhagic stroke subtypes.

Methods: A cross-sectional study was conducted at the Department of Medicine, Saidu Group of Teaching Hospital, Swat, over a period of six months. A total of 171 patients aged 20–75 years with CT-confirmed ischemic or hemorrhagic stroke were enrolled using non-probability consecutive sampling. Data on demographics, clinical history, and comorbidities were collected. Fasting lipid profiles were analyzed, and dyslipidemia was diagnosed based on standard criteria. Statistical analysis was conducted using SPSS v.21, with stratification and chi-square testing applied to assess associations.

Results: Among 171 stroke patients, 128 (74.9%) had ischemic stroke and 43 (25.1%) had hemorrhagic stroke. Dyslipidemia was present in 96 patients (56.1%), with higher prevalence in ischemic stroke (64.1%) compared to hemorrhagic stroke (32.6%). Gender distribution of dyslipidemia was comparable between males (57.7%) and females (54.1%). Common comorbidities included hypertension (57.9%) and diabetes mellitus (37.4%).

Conclusion: Dyslipidemia was frequently observed among stroke patients, particularly those with ischemic stroke. These findings support the inclusion of routine lipid screening in stroke evaluations and highlight the need for early interventions to reduce stroke burden through targeted lipid control strategies.

Keywords: Cerebrovascular Disorders, Cholesterol, Cross-Sectional Studies, Dyslipidemias, Hemorrhagic Stroke, Ischemic Stroke, Lipid Profile.

INTRODUCTION

Stroke, a leading cause of death and long-term disability worldwide, remains a major public health challenge due to its complex etiology and varied clinical presentations. Broadly classified into ischemic and hemorrhagic types, ischemic stroke results from the obstruction of cerebral blood vessels, while hemorrhagic stroke is caused by bleeding within or around the brain (1). Accurate classification of stroke subtypes is vital, as it directly influences management strategies and prognosis. While clinical symptoms may initially aid in differentiation, definitive diagnosis often requires neuroimaging such as non-contrast CT scans, which may not be readily available in all emergency settings, particularly in resource-limited healthcare facilities (2-4). Outcomes following stroke vary significantly based on the type, location, and extent of brain damage. Hemorrhagic strokes, although less common, are generally associated with higher morbidity and mortality than ischemic strokes, with prognosis largely determined by the volume and location of the bleeding (3,5). Early recognition and prompt intervention are therefore crucial in minimizing long-term neurological deficits and improving survival rates.

Dyslipidemia, characterized by abnormal levels of lipids in the blood, is a well-established modifiable risk factor for atherosclerotic cardiovascular disease and is frequently identified in patients with cerebrovascular conditions (6). Elevated levels of total cholesterol, low-density lipoprotein (LDL), and triglycerides, along with decreased high-density lipoprotein (HDL), contribute significantly to vascular pathology that may predispose individuals to ischemic events (7,8). Despite this association, the relationship between dyslipidemia and different subtypes of stroke remains inconsistent. While some studies have demonstrated a high prevalence of dyslipidemia among ischemic stroke patients (55%), much lower rates have been observed among those with hemorrhagic stroke (5.77%), suggesting potential subtype-specific variations in lipid profile abnormalities (9-11). In many regions, particularly in low- and middle-income countries, there remains a significant lack of localized data on the prevalence and pattern of dyslipidemia in stroke patients. This gap in knowledge hinders the development of targeted prevention strategies and effective management protocols. Recognizing and quantifying dyslipidemia among stroke patients may not only inform individualized treatment plans but also serve as a preventive tool in reducing stroke-related morbidity through timely risk factor modification. Given the limited evidence from the local population, the present study aims to determine the frequency of dyslipidemia among patients presenting with stroke to a tertiary care hospital. This will help bridge the existing knowledge gap and support clinicians in improving stroke care through enhanced identification and control of lipid abnormalities.

METHODS

This study was conducted as a cross-sectional analysis at the Department of Medicine, Saidu Group of Teaching Hospital, Swat. The duration of the study was a minimum of six months, commencing after formal approval of the research synopsis by the institutional ethical review board and the research department of the College of Physicians and Surgeons Pakistan (CPSP). Ethical approval was obtained, and all participants provided informed written consent after a thorough explanation of the study's purpose, benefits, and potential risks. A total sample of 171 patients was determined using the World Health Organization (WHO) sample size calculator, based on a dyslipidemia prevalence of 5.77% among patients with hemorrhagic stroke (8), with an absolute precision of 3.5% and a 95% confidence level. Non-probability consecutive sampling was employed to recruit eligible participants. The inclusion criteria encompassed both male and female patients aged between 20 and 75 years who were diagnosed with either ischemic or hemorrhagic stroke, confirmed via CT brain imaging. Patients were excluded if they had any malignancy, brain tumors, or were pregnant, to eliminate confounding variables that could independently influence lipid levels. Patients meeting the selection criteria were enrolled during routine hospital admissions and outpatient visits. Demographic details such as age, gender, BMI, educational and occupational status, socioeconomic background, and area of residence were documented using a standardized proforma.

A detailed medical history was obtained, and each participant underwent a thorough physical examination. Stroke subtype was confirmed through CT imaging; ischemic stroke was identified by features such as hypodensity, sulcal effacement, cortical swelling, and loss of gray-white differentiation, whereas hemorrhagic stroke was characterized by hyperdense intracranial bleeding with surrounding hypodense edema (12,13). Assessment of dyslipidemia was carried out based on predefined criteria, including any two of the following lipid abnormalities: total cholesterol > 5.2 mmol/L, triglycerides > 1.7 mmol/L, LDL cholesterol > 2.58 mmol/L, or HDL cholesterol <

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1.03 mmol/L (14). Blood samples were drawn using standard aseptic venipuncture techniques from a vein in the arm. After disinfection, a tourniquet was applied, and a needle was inserted to collect blood in vacuum-sealed vials. These samples were promptly transported to the hospital's laboratory for biochemical analysis. All procedures were supervised by a consultant physician with a minimum of five years of post-fellowship clinical experience. Statistical analysis was performed using SPSS version 21. Continuous variables such as age, weight, height, and BMI were expressed as mean ± standard deviation, whereas categorical variables including gender, presence of dyslipidemia, diabetes, hypertension, smoking history, educational level, occupational status, socioeconomic background, and residence were reported as frequencies and percentages. To account for potential effect modifiers, stratification was performed across key variables. Post-stratification, the chi-square test was used to assess associations, with a p-value < 0.05 considered statistically significant. Study findings were tabulated for clarity and comparison.

RESULTS

Out of a total of 171 patients enrolled in the study, the mean age was 58.3 ± 11.4 years, and the average BMI recorded was 26.1 ± 4.3 kg/m². Males constituted the majority, with 97 (56.7%) participants, while females comprised 74 (43.3%). Regarding socioeconomic distribution, 59 (34.5%) patients belonged to the lower class, 86 (50.3%) to the middle class, and 26 (15.2%) to the upper class. A total of 108 (63.2%) participants were educated, and 92 (53.8%) were employed. Urban residents made up 69 (40.4%) of the sample, while 102 (59.6%) resided in rural areas. Among comorbid conditions, 64 (37.4%) patients had diabetes, 99 (57.9%) were hypertensive, and 48 (28.1%) had a positive history of smoking. Out of the 171 stroke patients evaluated, dyslipidemia was diagnosed in 96 (56.1%) individuals based on lipid profile analysis, while 75 (43.9%) had normal lipid levels. Stratification by stroke subtype revealed that ischemic strokes accounted for the majority with 128 (74.9%) cases, of which 82 (64.1%) were dyslipidemic. In contrast, among the 43 (25.1%) patients diagnosed with hemorrhagic stroke, 14 (32.6%) demonstrated dyslipidemia. This suggests a higher frequency of lipid abnormalities among patients with ischemic stroke compared to hemorrhagic stroke. Gender-wise distribution of dyslipidemia showed that among 97 males, 56 (57.7%) were affected, whereas 40 (54.1%) of 74 females also met the criteria for dyslipidemia. The difference in dyslipidemia prevalence between genders was not marked, indicating a relatively balanced distribution across sexes. The above findings are presented visually in two accompanying bar charts. The first illustrates the overall frequency of dyslipidemia in the total sample, while the second compares the presence and absence of dyslipidemia across ischemic and hemorrhagic stroke subgroups.

Table 1: Demographic Characteristics of Study Participants (N = 171)

Variable		Frequency (%) / Mean ± SD
Mean Age (years)		58.3 ± 11.4
Gender	Male	97 (56.7%)
	Female	74 (43.3%)
Mean BMI (kg/m²)		26.1 ± 4.3
Socioeconomic Status	Lower	59 (34.5%)
	Middle	86 (50.3%)
	Upper	26 (15.2%)
Education Status	Educated	108 (63.2%)
	Uneducated	63 (36.8%)
Occupation Status	Employed	92 (53.8%)
	Unemployed	79 (46.2%)
Residence	Rural	102 (59.6%)
	Urban	69 (40.4%)
Diabetes	Yes	64 (37.4%)
	No	107 (62.6%)
Hypertension	Yes	99 (57.9%)
	No	72 (42.1%)
Smoking History	Yes	48 (28.1%)
	No	123 (71.9%)

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Table 2: Frequency of Dyslipidemia in Stroke Patients

Dyslipidemia Status	Frequency	Percentage (%)
Yes	96	56.1%
No	75	43.9%

Table 3: Dyslipidemia Stratified by Stroke Type

Stroke Type	Total Patients	Dyslipidemia Present	Dyslipidemia Absent
Ischemic	128	82 (64.1%)	46 (35.9%)
Hemorrhagic	43	14 (32.6%)	29 (67.4%)

Table 4: Dyslipidemia Stratified by Gender

Gender	Total Patients	Dyslipidemia Present	Dyslipidemia Absent
Male	97	56 (57.7%)	41 (42.3%)
Female	74	40 (54.1%)	34 (45.9%)

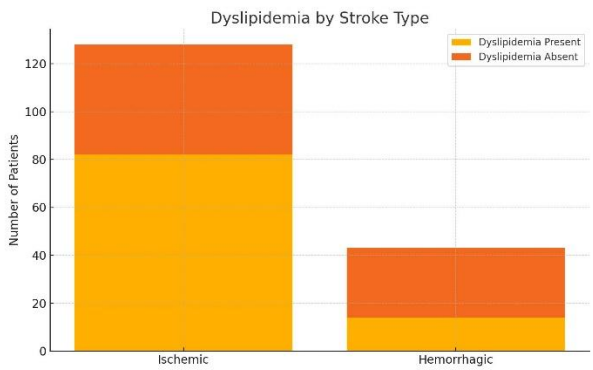

Figure 1 Dyslipidemia by Stoke Type

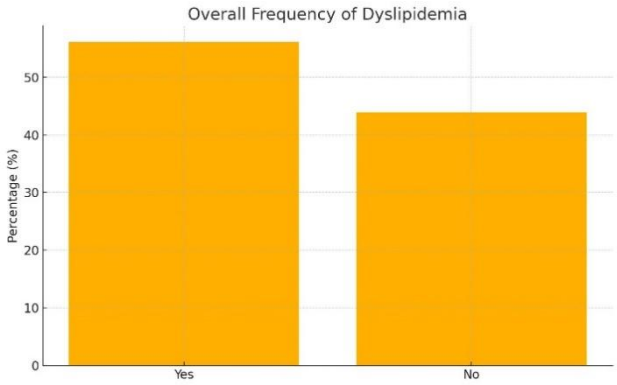

Figure 2 Overall Frequency of Dyslipidemia

DISCUSSION

The findings of this study revealed that more than half (56.1%) of the patients presenting with stroke at a tertiary care hospital had dyslipidemia, with a notably higher prevalence among those with ischemic stroke compared to hemorrhagic stroke. This aligns with recent literature suggesting that dyslipidemia is a significant and common modifiable risk factor in ischemic stroke patients. Multiple studies have reported comparable or even higher prevalence rates. For example, a study observed dyslipidemia in 80% of ischemic stroke patients, with high triglycerides and total cholesterol being the most common abnormalities (15,16). Similarly, a study documented a 97% dyslipidemia prevalence among stroke patients, particularly in those with reduced HDL and elevated LDL (17). These findings support the consistency and clinical significance of dyslipidemia in cerebrovascular disease and further justify the focus on lipid profile screening in stroke patients. The higher prevalence of dyslipidemia in ischemic stroke compared to hemorrhagic stroke has been echoed by several observational studies. A cross-sectional study found significantly elevated LDL and total cholesterol levels in ischemic stroke patients, linking these abnormalities with greater stroke-related mortality risks (18). Moreover, recent prospective research reported a dyslipidemia prevalence of 39.4% in ischemic stroke, with a strong association observed in males and smokers (19)

Interestingly, the current study found a nearly equal gender distribution in dyslipidemia prevalence, consistent with results from studies in Nigeria and Palestine, which reported no statistically significant gender differences (20,21). However, studies in Egypt and Nepal have shown higher dyslipidemia rates in males, possibly due to differences in lifestyle, dietary habits, and smoking rates across populations. The study reinforces the importance of considering dyslipidemia in the routine evaluation and secondary prevention strategies of stroke, especially ischemic subtypes. Statin therapy has been strongly endorsed for secondary prevention in these cases, as

evidenced by improved outcomes in randomized trials and real-world settings (22-24). Despite its valuable insights, the present study has certain limitations. The single-center design limits generalizability to broader populations. The sample size, though adequate for internal estimates, may not capture population-level variability. The use of non-probability consecutive sampling introduces potential selection bias. Furthermore, detailed sub-fractional lipid analysis, such as VLDL or LP(a), was not included, which could have offered more nuanced understanding of dyslipidemic patterns in stroke. Additionally, the study did not assess dietary intake, physical activity, or genetic predispositions, which are known to influence lipid metabolism.

Among the strengths of this study is its use of CT-confirmed stroke classification, reducing misclassification bias between ischemic and hemorrhagic subtypes. The application of standardized diagnostic criteria for dyslipidemia enhances reliability, and stratification by demographic and clinical variables adds robustness to the analysis. Future research should focus on multi-centered, population-based cohorts to validate these findings. Investigating the impact of lipid-lowering interventions in stroke recurrence rates across subtypes and demographic strata can inform personalized treatment protocols. Longitudinal studies assessing lipid fluctuations pre- and post-stroke, and their correlation with outcomes, would further deepen understanding of dyslipidemia's pathophysiological role in cerebrovascular disease. In conclusion, this study confirms a high burden of dyslipidemia among stroke patients, particularly in ischemic stroke cases. These findings emphasize the importance of routine lipid screening and tailored therapeutic interventions in stroke care pathways, thereby contributing to risk reduction and better prognostic outcomes.

CONCLUSION

This study concluded that dyslipidemia is highly prevalent among stroke patients, particularly those with ischemic stroke. The findings emphasize the critical role of lipid profile screening in routine stroke assessment and management. Early identification and targeted control of dyslipidemia could significantly reduce stroke-related morbidity, offering a valuable avenue for primary and secondary prevention strategies in clinical practice.

AUTHOR CONTRIBUTION

Author	Contribution
Karim Ullah*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Muhammad Ayub Khan	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published

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