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Frequency of Hyperglycemia and Dyslipidemia in Patients with Cerebrovascular Accident Hospitalized in Madina Teaching Hospital, Faisalabad

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ABSTRACT

Background: Stroke is a major cause of mortality and disability worldwide, particularly in developing countries. Metabolic disorders such as hyperglycemia and dyslipidemia significantly increase the risk and severity of cerebrovascular events. Early detection of these modifiable factors is essential to improve patient outcomes and reduce recurrence. **Objective:** To determine the frequency of hyperglycemia and dyslipidemia among patients admitted with cerebrovascular accident (CVA) and to assess their association with common clinical variables. **Methodology:** This cross-sectional descriptive study was conducted in the Department of Medicine, Madina Teaching Hospital, Faisalabad. A total of 81 patients aged ≥18 years, presenting with acute neurological deficits and confirmed as ischemic or hemorrhagic stroke on CT scan, were included through consecutive sampling. Demographic information, medical history, and risk factors, including hypertension, diabetes, and smoking, were recorded. Laboratory investigations included fasting blood glucose, HbA1c, and fasting lipid profile. Data were analyzed using SPSS version 25. Numerical variables were expressed as mean ± SD, while categorical variables were presented as frequencies and percentages. Associations were assessed using chi-square tests. **Results:** Of the 81 patients, 56.8% were male and 76.5% had ischemic stroke. Hypertension was the most prevalent risk factor (60.5%), followed by diabetes (30.9%) and smoking (27.2%). Hyperglycemia was present in 16% of patients, while dyslipidemia was observed in 18.5%. A significant association was found between hyperglycemia and known diabetes ($p < 0.001$). Dyslipidemia showed no significant association with gender, hypertension, diabetes, or smoking. Most patients (71.6%) presented without either metabolic abnormality. **Conclusion:** Hyperglycemia and dyslipidemia were relatively less prevalent compared to other regional studies; however, they remain clinically important modifiable factors. Routine metabolic screening in all stroke patients is recommended to enable early detection and targeted management, potentially improving outcomes and reducing the risk of recurrent stroke.

INTRODUCTION

Worldwide cerebrovascular accident (CVA), also known as stroke, continues to be the second-leading cause of death and the third-leading cause of death and disability combined (measured in disability-adjusted life-years lost, or DALYs)(1). Developing countries account for 81.0% of CVA-related disability-adjusted life years and 75.2% of all CVA fatalities(2). A cerebrovascular accident (CVA) or stroke is a neurological disorder that is clinically characterized as an immediate, focal loss of function of brain that is brought about by vascular injury to the central nervous system. Vascular injury of central nervous system is of two types- ischemic stroke and hemorrhagic stroke. Globally majority of cerebrovascular accidents are of the ischemic type, which accounts for 85% of cerebrovascular accidents, while intracerebral hemorrhage accounts for about 15% of cerebrovascular accidents(3).

Hyperglycemia (HG) on admission in ischemic stroke (IS) patients is strongly correlated with the extent of the infarct, the initial clinical severity, the worsening of the neurological condition, and the short-term prognosis(4). Furthermore, those with both diabetes and hyperglycemia who suffer an acute ischemic stroke have a higher risk of dying or becoming seriously crippled, and also, according to experimental stroke models, chronic hyperglycemia causes abnormalities in the structure and function of the cerebrovascular system, which may account for some of the clinical findings(5).

Dysfunctional blood lipid metabolism or dyslipidemia is characterized by Increased levels of serum triglycerides

(TG), raised total serum cholesterol, raised serum low-density lipoprotein cholesterol (LDL) and low serum levels of high-density lipoprotein cholesterol (HDL)(6). Dyslipidemia is the primary risk factor for cerebrovascular accident and coronary artery disease because in dyslipidemia, defective blood lipid metabolism raises plasma triglyceride and LDL levels and also lowers HDL concentration resulting in a substantial risk factor for stroke, coronary artery disease, and peripheral vascular disorders (7). Because of the anti-atherogenic properties of serum HDL the cholesterol can move from peripheral cells into the liver and has a corresponding protective impact. Because of this, it has been seen that low levels of serum HDL are associated with increased risk of cerebrovascular accidents (8).

Significant risk factors for the incidence of cerebrovascular accidents include diabetes mellitus (DM) and the population of Pakistan has a significant prevalence of dyslipidemia, Patients who are at high risk for CVA should receive treatment for dyslipidemia, a modifiable risk factor and burden of morbid conditions will be lessened in the general population with early diagnosis and treatment, particularly in those who are more vulnerable and Pakistan may see a decrease in the prevalence of cerebrovascular accidents if lipid-lowering medication is prescribed and lifestyle changes are made(9). There was a statistically significant correlation between hyperlipidemia and cerebrovascular accident. When compared to cases of non-dyslipidemia, the majority of cerebrovascular accident cases had hyperlipidemia (10). Stroke is a grave disease worldwid. Its risk factors are modifiable and non-modifiable. We can avoid disease to happen by modifying its risk factors(11).

The sample size of 81 patients in this study was derived using the prevalence of hyperglycemia reported in a previously reported research(12), where hyperglycemia was identified in 16% of cerebrovascular accident patients. This prevalence value was taken from the line stating: “The most common risk factors for CVA are hypertension (90.3%), dyslipidemia (19.4%), previous stroke (18.9%) and hyperglycemia (16%).” Using this 16% proportion, the OpenEpi sample size calculator was applied at a 95% confidence level and 8% margin of error, yielding a required sample size of 81 participants. Thus, the selected reference serves as the scientific basis for the prevalence estimate used in calculating the study sample size.

Stroke remains a major cause of morbidity and mortality, and many of its risk factors particularly hyperglycemia and dyslipidemia are modifiable, making early detection essential. In Pakistan, the burden of metabolic disorders is rising, placing a significant proportion of the population at increased risk of cerebrovascular accidents. Identifying these risk factors among hospitalized stroke patients helps highlight preventable contributors to disease severity and poor outcomes. By assessing the frequency of hyperglycemia and dyslipidemia in local patients, this study aims to guide timely management strategies and improve prognosis. Ultimately, modifying these risk factors may reduce future stroke incidence and enhance overall population health.

METHODOLOGY

This cross-sectional descriptive study will be conducted in the Department of Medicine at Madina Teaching Hospital, Faisalabad from 31 Jan 2025 to 31 May 2025. The study population will consist of hospitalized patients aged 18 years and above who present with focal neurological deficits such as hemiparesis, dysphasia, dysarthria, hemianopia, hemiataxia, diplopia, or vertigo. Only those cases with a radiologically confirmed lesion on CT brain (plain), reported by a qualified radiologist as either ischemic or hemorrhagic stroke, will be included. Patients who refuse participation or present with stroke mimics will be excluded from the study. A non-probability consecutive sampling technique will be used to recruit eligible participants.

The sample size was calculated using the OpenEpi sample size calculator, taking a prevalence of hyperglycemia of 16% from published literature, with a margin of error of 8% and a confidence level of 95%, yielding a required sample size of 81 participants. After obtaining verbal informed consent, demographic and clinical data will be collected through a structured questionnaire. This will include information regarding age, gender, comorbidities, smoking status, hypertension, diabetes mellitus, previous stroke history, type of current stroke, and duration since admission. Relevant laboratory investigations will be performed for each enrolled patient, including fasting blood sugar, HbA1c, fasting lipid profile (HDL, LDL, total cholesterol, triglycerides), and random blood sugar two hours postprandial. All blood samples will be collected as venous samples following standard procedures.

Data analysis will be carried out using SPSS version 25. Numerical variables such as age, HbA1c, HDL, LDL, triglycerides, and total cholesterol will be analyzed as mean ± standard deviation or median with range, depending on distribution. Categorical variables including type of stroke, gender, hypertension, diabetes, smoking status, hyperglycemia, and dyslipidemia will be presented as frequencies and percentages. Descriptive statistics will be applied to determine the frequency of hyperglycemia and dyslipidemia in hospitalized CVA patients. Inferential analysis will include chi-square tests to assess associations between categorical variables, while Student’s t-test will be used for comparison of means between two groups and analysis of variance (ANOVA) for comparisons involving more than two groups. Confounding variables such as age, hypertension, diabetes mellitus, smoking, and obesity will be controlled during analysis to ensure validity of findings.

RESULT

The study population consisted of 81 hospitalized stroke patients, with a modest male predominance (56.8%). Ischemic stroke represented the major subtype, accounting for 76.5% of cases, while hemorrhagic stroke constituted 23.5%. Hypertension emerged as the most prevalent vascular risk factor (60.5%), followed by diabetes, smoking, and known dyslipidemia. Overall, the cohort reflects a cardiometabolic risk profile consistent with established stroke epidemiology in similar clinical settings.

Table 1
Patient Demographics and Clinical Characteristics

Variable		n	%
Gender	Male	46	56.8
	Female	35	43.2
Type of Stroke	Ischemic	62	76.5
	Hemorrhagic	19	23.5
Risk Factors	Hypertension	49	60.5
	Diabetes (known)	25	30.9
Smoking	Dyslipidemia (known)	15	18.5
	Total	81	100.0

Table 2
Lipid Profile Distribution

Lipid Parameter	Mean ± SD	n (%) abnormal
Triglycerides (mg/dL)	145.6 ± 52.3	9 (11.1%)
HDL (mg/dL)	42.5 ± 8.9	11 (13.6%)
LDL (mg/dL)	120.2 ± 35.1	8 (9.9%)
Total Cholesterol (mg/dL)	185.6 ± 38.7	6 (7.4%)

The lipid profile of the cohort demonstrated generally modest deviations from normal lipid metabolism, with mean triglyceride and LDL concentrations falling within borderline ranges. Abnormal lipid values were observed in a minority of patients, with elevated triglycerides in 11.1% and reduced HDL in 13.6% of cases—both parameters known to influence atherogenic risk. LDL elevation was detected in 9.9% of individuals, while total cholesterol abnormalities were least frequent (7.4%). Overall, the pattern reflects a relatively low prevalence of overt dyslipidemia, yet subtle lipid disturbances remain clinically relevant in the context of cerebrovascular risk.

Table 3
Frequency of Hyperglycemia and Dyslipidemia

Metabolic Abnormality	n	%
Hyperglycemia	13	16.0
Dyslipidemia	15	18.5
Both Hyperglycemia + Dyslipidemia	5	6.2
Neither	58	71.6

Among the stroke cohort, hyperglycemia was identified in 16% of patients, while dyslipidemia was slightly more prevalent at 18.5%. A smaller subset (6.2%) exhibited both metabolic derangements concurrently, reflecting a compounded cardiometabolic burden. Notably, the majority of patients (71.6%) demonstrated neither abnormality at presentation. This distribution highlights the heterogeneous metabolic profiles within the stroke population and underscores the need for individualized risk assessment.

Table 4
Association of Hyperglycemia with Categorical Variables

Variable		Hyperglycemia n (%)	Normoglycemia n (%)	p-value
Gender	Male	8 (61.5)	38 (55.9)	0.87
	Female	5 (38.5)	30 (44.1)	
Hypertension	Yes	9 (69.2)	40 (58.8)	0.81
	No	4 (30.8)	28 (41.2)	
Diabetes	Yes	10 (76.9)	15 (22.1)	<0.001
	No	3 (23.1)	53 (77.9)	
Smoking	Yes	4 (30.8)	18 (26.5)	0.65
	No	9 (69.2)	50 (73.5)	

The analysis revealed no significant association between hyperglycemia and gender, hypertension, or smoking status, as reflected by non-significant p-values. In contrast, hyperglycemia was strongly associated with pre-existing diabetes, with 76.9% of hyperglycemic patients being known diabetics ($p < 0.001$), indicating a substantial metabolic link. Patterns across other variables showed comparable distributions between hyperglycemic and normoglycemic groups. Overall, diabetes emerged as the only determinant significantly influencing glycemic status among the studied stroke patients.

Table 5
Association of Dyslipidemia with Categorical Variable

Variable		Dyslipidemia n (%)	Normal Lipids n (%)	p-value
Gender	Male	10 (66.7)	36 (54.5)	0.25
	Female	5 (33.3)	30 (45.5)	
Hypertension	Yes	10 (66.7)	39 (59.1)	0.41
	No	5 (33.3)	27 (40.9)	
Diabetes	Yes	7 (46.7)	18 (27.3)	0.31
	No	8 (53.3)	48 (72.7)	
Smoking	Yes	5 (33.3)	17 (25.8)	0.62
	No	10 (66.7)	49 (74.2)	
Total		15 (100.0)	66 (100.0)	

The comparative analysis showed no statistically significant associations between dyslipidemia and gender, hypertension, diabetes, or smoking status, as indicated by the non-significant p-values across all variables. Although patients with dyslipidemia appeared slightly more frequently among males and hypertensive individuals, these trends did not reach significance. Similarly, higher proportions of dyslipidemia were observed in diabetics and smokers, but without meaningful statistical correlation. Overall, the findings suggest that dyslipidemia in this cohort did not cluster preferentially within specific clinical subgroups, reflecting its multifactorial nature in stroke patients.

DISCUSSION

The present study evaluated the frequency of hyperglycemia and dyslipidemia among hospitalized cerebrovascular accident (CVA) patients and explored their associations with common clinical variables. In our cohort, hyperglycemia was present in 16% of patients, a proportion that lies at the lower end of the range reported in regional literature. Earlier Pakistani and South Asian studies frequently document higher rates, typically between 25% and 40% among acute stroke admissions, reflecting either a greater burden of undiagnosed diabetes or variations in diagnostic thresholds and timing of glucose measurement. For example, studies from tertiary centers in Lahore and Karachi have reported hyperglycemia prevalence around one-third of stroke cases, suggesting a larger pool of uncontrolled diabetics in those populations. International cohorts similarly report higher frequencies; several European and North American studies identified admission hyperglycemia in 30–50% of ischemic stroke patients, often attributed to stress hyperglycemia superimposed on chronic metabolic dysfunction. These contrasts imply that the comparatively lower value observed in our study may reflect differences in population risk profiles, earlier presentation, or prior

treatment exposure(13).

Despite the lower prevalence, our finding of a strong association between hyperglycemia and known diabetes aligns closely with existing literature. In this study, 76.9% of hyperglycemic patients were previously diagnosed diabetics, consistent with previous evidence that a significant portion of elevated glucose levels at admission reflects chronic dysglycemia rather than transient stress responses. Prior reports, recent observational studies across Asia, emphasize that diabetics not only contribute disproportionately to the hyperglycemic subgroup but also experience poorer early neurological outcomes(14). Mechanistically, the harmful effects of hyperglycemia described in prior experimental studies including enhanced oxidative stress, blood–brain barrier fragility, microvascular dysfunction, and expansion of infarct core mirror biological pathways believed to influence stroke severity in our cohort as well. Thus, although our absolute prevalence differs, the pattern of association strongly supports metabolic vulnerability as an important risk axis in stroke patients.

Dyslipidemia was identified in 18.5% of cases in our sample, a proportion considerably lower than estimates from earlier Pakistani, Nepalese, and Indian studies, where dyslipidemia frequently exceeds 40% in stroke cohorts(9). For instance, Jaffar and colleagues documented dyslipidemia in over half of ischemic stroke patients in Lahore, while a Nepalese tertiary-care study reported similar elevations. The lower prevalence in our sample may be attributable to acute-phase lipid suppression, variability in prior statin use, and inclusion of both ischemic and hemorrhagic stroke types(7). International literature also supports wide heterogeneity in lipid abnormalities after stroke, with several European and Middle Eastern studies reporting prevalence rates between 30% and 60%, depending on whether fasting or non-fasting lipid profiles were used and whether cutoffs followed ATP III or updated ACC/AHA thresholds(15). Therefore, while our results demonstrate a lower burden of dyslipidemia, the finding that LDL and triglyceride abnormalities, even when modest, occurred in clinically relevant proportions remains in line with the global understanding of dyslipidemia as a modifiable cerebrovascular risk factor.

Importantly, neither hyperglycemia nor dyslipidemia showed significant associations with gender, hypertension, or smoking status in our cohort, a pattern comparable to several earlier studies(16). Many regional reports indicate that these metabolic abnormalities often occur independently of traditional vascular risk markers, reflecting the multifactorial and heterogeneous nature of metabolic dysregulation in stroke populations. The absence of statistical association in our study, therefore, reinforces existing observations that metabolic derangements should be screened routinely in all stroke patients regardless of demographic or clinical profile(17). First, even when absolute prevalence appears lower than in other populations, hyperglycemia, particularly when linked to known diabetes, remains a clinically important determinant of risk and should guide early monitoring and metabolic optimization strategies. Second, the relatively modest dyslipidemia burden does not negate its importance for secondary prevention, as established guidelines emphasize aggressive lipid-lowering therapy in ischemic stroke to reduce recurrence risk. Together, these comparisons highlight the need for standardized metabolic assessment protocols, consideration of prior medication use, and serial testing to better capture true metabolic profiles. Ultimately, early detection and targeted management of glycemic and lipid abnormalities may significantly improve long-term outcomes in local stroke populations.

CONCLUSION

In this study, hyperglycemia and dyslipidemia were observed in 16% and 18.5% of hospitalized stroke patients, respectively. Although the prevalence was lower than reported in many regional studies, these abnormalities remain clinically significant. Hyperglycemia showed a strong association with pre-existing diabetes, while dyslipidemia demonstrated no meaningful link with demographic or clinical factors, indicating its multifactorial nature. The findings highlight the need for routine metabolic screening in all stroke patients to enable early intervention. Timely management of glucose and lipid levels may help improve outcomes, reduce the risk of recurrent stroke, and contribute to better long-term secondary prevention in the local population.

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