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Prevalence of Hyperuricemia in Acute Stroke Patients

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Abstract

Background: Hyperuricemia has been increasingly associated with cerebrovascular disease and may influence the severity and outcome of acute stroke. However, the exact role of serum uric acid in stroke remains controversial.

Objectives: To determine the prevalence of hyperuricemia in acute stroke patients and to evaluate its association with stroke severity using NIHSS and GCS scores.

Material and Methods: This hospital-based cross-sectional analytical study was conducted in the Department of General Medicine, Government Medical College, Srinagar, from February 2024 to February 2026. A total of 200 patients with radiologically confirmed acute stroke were included. Detailed clinical evaluation, laboratory investigations, serum uric acid estimation, and neuroimaging were performed in all patients. Stroke severity was assessed using the National Institutes of Health Stroke Scale (NIHSS) score and Glasgow Coma Scale (GCS). Statistical analysis was carried out using SPSS version 20.

Results: The mean age of the study population was 62.14 ± 13.95 years, with male predominance (54%). Ischemic stroke constituted 77% of cases, while hemorrhagic stroke accounted for 23%. Hyperuricemia was observed in 48% of patients. A significant association was found between hyperuricemia and ischemic stroke (p=0.021). Hyperuricemia also showed significant association with higher NIHSS severity scores (p=0.0008) and severe GCS impairment (p=0.0001). Multivariate regression analysis demonstrated significant association of

hyperuricemia with hypertension, diabetes mellitus, ischemic stroke, severe NIHSS score, and severe GCS impairment.

Conclusion: Hyperuricemia is highly prevalent among acute stroke patients and is significantly associated with greater stroke severity. Serum uric acid may serve as a useful biochemical marker for severity assessment in acute stroke patients.

Keywords: Hyperuricemia, Acute Stroke, Serum Uric Acid, NIHSS score, Glasgow Coma Scale

Introduction

Stroke, also known as cerebrovascular accident (CVA), is a sudden onset neurological deficit caused by disturbance in cerebral blood supply and remains one of the leading causes of mortality and disability worldwide[1]. Globally, stroke is the second leading cause of death and a major contributor to long-term disability, particularly in low- and middle-income countries[2,3]. In India, the burden of stroke is steadily increasing due to rapid urbanization, changing lifestyles, and rising prevalence of vascular risk factors[4]. Stroke is broadly classified into ischemic and hemorrhagic types[5]. Ischemic stroke accounts for nearly 80–85% of all strokes and occurs due to interruption of cerebral blood flow, whereas hemorrhagic stroke results from rupture of cerebral blood vessels with bleeding into the brain parenchyma or subarachnoid space[5,6]. Hypertension, diabetes mellitus, dyslipidemia, smoking, obesity, and advancing age are among the major risk factors associated with stroke[7,8].

Serum uric acid (SUA) is the final product of purine metabolism and is excreted mainly through the kidneys[9]. Hyperuricemia is generally defined as SUA levels greater than 7 mg/dL in males and 6 mg/dL in females[10]. Elevated serum uric acid has been associated with hypertension, metabolic syndrome, endothelial dysfunction, inflammation, and atherosclerosis[11]. The association between hyperuricemia and stroke remains controversial. Several studies have reported a higher prevalence of hyperuricemia among acute stroke patients and its association with increased stroke severity and poor outcomes[12-15]. On the other hand, uric acid also acts as a potent antioxidant and may exert neuroprotective effects during cerebral ischemia[16,17]. Studies by Mehrpour et al., Kotwal et al., and Paikra et al. demonstrated a high prevalence of hyperuricemia among acute stroke patients[12,13,15]. Elevated serum uric acid levels have also been correlated with higher NIHSS scores, increased neurological deficit, and poor functional recovery[14,18,19]. However, conflicting evidence still exists regarding whether hyperuricemia is merely an associated finding or an independent predictor of stroke severity and prognosis.

Therefore, the present study was undertaken to determine the prevalence of hyperuricemia in acute stroke patients and to evaluate its association with stroke severity using standardized clinical scales such as NIHSS and GCS.

Material And Methods

This hospital-based cross-sectional analytical study was conducted in the Department of General Medicine, Government Medical College, Srinagar, over a period of two years from February 2024 to February 2026. The study included 200 patients diagnosed with acute stroke who fulfilled the inclusion and exclusion criteria. Ethical clearance was obtained from the Institutional Ethics Committee prior to commencement of the study, and informed consent was taken from all participants or their attendants. Patients aged more than 18 years presenting with first-ever acute stroke within 48 hours of onset and confirmed radiologically by NCCT/MRI brain were included in the study. Patients with recurrent stroke, chronic kidney disease, gout, hematological disorders, malignancy, chronic liver disease, patients on uric acid-

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lowering therapy, and those with conditions known to affect serum uric acid levels were excluded.

A detailed clinical history was obtained, including demographic details, vascular risk factors, and comorbidities such as hypertension, diabetes mellitus, smoking, alcohol intake, dyslipidemia, and ischemic heart disease. Thorough general physical examination and systemic examination were performed in all patients. Stroke severity was assessed using the National Institutes of Health Stroke Scale (NIHSS), while level of consciousness was evaluated using the Glasgow Coma Scale (GCS). Routine laboratory investigations including complete blood count, blood sugar, renal function tests, lipid profile, and serum uric acid levels were performed. Serum uric acid estimation was carried out using the uricase enzymatic method. Hyperuricemia was defined as serum uric acid level >7 mg/dL in males and >6 mg/dL in females. Radiological evaluation was done using non-contrast computed tomography (NCCT) or magnetic resonance imaging (MRI) brain to classify stroke as ischemic or hemorrhagic and to identify the site of involvement.

The collected data were entered in Microsoft Excel and analyzed using SPSS version 20. Quantitative variables were expressed as mean ± standard deviation, while qualitative variables were expressed as frequency and percentage. Association between categorical variables was assessed using Chi-square test, and p-value <0.05 was considered statistically significant.

Results

A total of 200 patients with acute stroke fulfilling the inclusion and exclusion criteria were enrolled in the present study. Detailed demographic characteristics, clinical profile, radiological findings, serum uric acid status, and their association with stroke severity were analyzed and are presented in the following tables.

Table 1: Distribution of patients as per age, gender and comorbidity (n=200)

Variable	Category	Number of Patients	Percentage (%)
Age in Years	<40	16	8.0
	40–60	73	36.5
	>60	111	55.5
Gender	Male	108	54.0
	Female	92	46.0
Comorbidity	Hypertension	72	36.0
	Diabetes Mellitus	28	14.0
	Hypertension + Diabetes Mellitus	46	23.0
	Smoking	18	9.0
	Dyslipidemia	10	5.0
	Ischemic Heart Disease	8	4.0

The majority of the study subjects belonged to the age group of more than 60 years, accounting for 55.5% of the total study population, followed by the 40–60 years age group comprising 36.5% patients. Only 8% of patients were younger than 40 years. The mean age of the study population was 62.14 ± 13.95 years. Out of 200 study subjects, 108 (54%) were males and 92 (46%) were

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females, showing a slight male predominance among acute stroke patients.

Hypertension was the most common comorbidity observed in the study subjects, present in 36% patients, followed by combined hypertension and diabetes mellitus in 23% patients. Diabetes mellitus alone was seen in 14% patients, while smoking, dyslipidemia, and ischemic heart disease were present in 9%, 5%, and 4% patients respectively.

Table 2: Distribution of patients as per Type of Stroke and Presence of Serum Uric Acid (n=200)

Variable	Category	Number of Patients	Percentage (%)
Type of Stroke	Ischemic Stroke	154	77.0
	Hemorrhagic Stroke	46	23.0
SUA Status	Hyperuricemia Present	96	48.0
	Normouricemia Present	104	52.0

Ischemic stroke was the predominant type of stroke observed in the study population, accounting for 77% of cases, whereas hemorrhagic stroke constituted 23% of cases.

Hyperuricemia was present in 96 patients, accounting for 48% of the study population, while normouricemia was observed in 52% of patients.

Table 3: Association between stroke type and hyperuricemia

Stroke Type	Hyperuricemia Present	Normouricemia Present	Total	p-value
Ischemic Stroke	82	72	154	0.021
Hemorrhagic Stroke	14	32	46	
Total	96	104	200	

Among patients with ischemic stroke, 82 patients had hyperuricemia while 72 had normouricemia. In hemorrhagic stroke, hyperuricemia was present in 14 patients and absent in 32 patients. A statistically significant association was observed between stroke type and serum uric acid status ($p = 0.021$).

Table 4: Association between NIHSS score and hyperuricemia

NIHSS Severity	Hyperuricemia Present	Normouricemia Present	Total	p-value
Mild	8	24	32	0.0008
Moderate	26	42	68	
Moderate-Severe	30	24	54	
Severe	32	14	46	
Total	96	104	200	

Hyperuricemia was increasingly associated with greater stroke severity. Severe NIHSS scores were observed in 32 hyperuricemic patients compared to 14 normouricemic patients. A statistically significant association was found between NIHSS severity and hyperuricemia ($p = 0.0008$).

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Table 5: Association between GCS score and hyperuricemia

GCS	Hyperuricemia Present	Normouricemia Present	Total	p-value
Mild	22	54	76	0.0001
Moderate	38	36	74	
Severe	36	14	50	
Total	96	104	200	

Severe GCS impairment was more commonly observed among patients with hyperuricemia. Severe GCS scores were seen in 36 hyperuricemic patients compared to 14 normouricemic patients. The association between GCS severity and hyperuricemia was statistically significant (p = 0.0001).

Table 6: Multivariate logistic regression analysis for predictors of hyperuricemia

Variable	Odds Ratio (OR)	95% Confidence Interval	p-value
Hypertension	2.14	1.18 – 3.92	0.012
Diabetes Mellitus	1.84	1.02 – 3.41	0.041
Ischemic Stroke	2.36	1.21 – 4.58	0.009
Severe NIHSS Score	3.12	1.68 – 5.84	0.001
Severe GCS Impairment	2.88	1.54 – 5.26	0.002

Multivariate logistic regression analysis demonstrated that hypertension, diabetes mellitus, ischemic stroke, severe NIHSS score, and severe GCS impairment were independently associated with hyperuricemia. Severe NIHSS score showed the strongest association with hyperuricemia (OR = 3.12, p = 0.001).

Discussion

The present hospital-based cross-sectional study was conducted to determine the prevalence of hyperuricemia in acute stroke patients and to evaluate its association with stroke severity. A total of 200 patients with acute stroke were included in the study.

The mean age of the patients in the present study was 62.14 ± 13.95 years, with the majority of patients belonging to the age group of more than 60 years. Similar findings were reported by Mehrpour M et al., (2012)[12] and Ashaduzzaman M et al.[20] who also observed higher prevalence of stroke among elderly patients. Males constituted 54% of the study population, showing slight male predominance, comparable to findings reported by Patil TB et al.[21] and Behera BK et al.[22]. Hypertension was the most common comorbidity observed in the present study, followed by combined hypertension and diabetes mellitus. Similar observations were made by Kaspa C and Govindu S[23], who also reported hypertension and diabetes mellitus as common risk factors among stroke patients.

Ischemic stroke accounted for 77% of cases, while hemorrhagic stroke constituted 23% of cases, which is consistent with previous epidemiological studies showing ischemic stroke as the predominant stroke subtype[4,5]. The prevalence of hyperuricemia in the present study was 48%. Comparable prevalence rates were reported by Mehrpour et al.[12] (47.3%), Paikra S et al.[24] (49%), and Mapoure YN et al.[25] (52.3%). A statistically significant association was observed between hyperuricemia and ischemic stroke in the present study. Similar findings were reported by Patil TB et al.[21] and Khatri A et al.[26] who demonstrated significantly higher serum uric acid levels in acute ischemic stroke patients.

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The present study demonstrated a significant association between hyperuricemia and stroke severity assessed by NIHSS score (p = 0.0008). Hyperuricemic patients had higher NIHSS scores indicating greater neurological deficit. Similar observations were reported by Paikra S et al.[24], Behera BK et al.[22], and Singh SK et al.,[27] who found a positive correlation between serum uric acid levels and NIHSS severity. A statistically significant association was also observed between hyperuricemia and severe GCS impairment (p = 0.0001). Similar findings were documented by Paikra S et al.[24] who reported higher serum uric acid levels among patients with lower GCS scores.

Multivariate regression analysis in the present study showed that hypertension, diabetes mellitus, ischemic stroke, severe NIHSS score, and severe GCS impairment were independently associated with hyperuricemia. Similar associations were reported by Sarfo FS et al.[18], Mapoure YN et al.[12], and Ashaduzzaman M et al.[20].

Conclusion

Hyperuricemia was highly prevalent among acute stroke patients and showed a significant association with increased stroke severity as assessed by NIHSS and GCS scores. Elevated serum uric acid levels were more commonly observed in ischemic stroke patients. Serum uric acid may serve as a useful biochemical marker for severity assessment in acute stroke patients.

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