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Study of clinicodemographic profile and serum uric acid levels in patient with acute ischemic stroke in tertiary care centre

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Abstract

Background: Acute ischemic stroke (AIS) is a critical cause of adult disability and mortality worldwide, with particularly high prevalence and incidence rates in India. Several risk factors, including hypertension, diabetes, dyslipidemia, smoking, obesity, and metabolic syndrome, have been associated with AIS and elevated serum uric acid (SUA) levels. This study aims to analyze the clinicodemographic profile and SUA levels in AIS patients at a tertiary care center in central India, examining the relationship between SUA and AIS presentation and outcomes. **Methods:** A cross-sectional study was conducted over 18 months at the Sri Aurobindo Medical College and Postgraduate Institute, Indore, India, involving 100 AIS patients admitted to the neurology outpatient department. Data were collected through clinical assessments and laboratory investigations, including SUA levels, complete blood count, lipid profile, and fasting blood sugar, as well as radiological evaluations. Descriptive statistics summarized demographic, clinical, and laboratory characteristics, and SUA levels were correlated with risk

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factors and stroke severity. **Results:** The mean age of patients was 61.17 ± 14.01 years, with a male predominance (male-to-female ratio of 1.7:1). Hypertension (65%), dyslipidemia (55%), and diabetes mellitus (40%) were the most prevalent risk factors. Hyperuricemia was present in 47% of patients, with an overall mean SUA level of 6.48 ± 1.92 mg/dl. Higher SUA levels were observed in patients with diabetes (6.85 ± 1.86 mg/dl) and metabolic syndrome (6.82 ± 1.62 mg/dl). Stroke severity varied, with 40% of patients experiencing mild, 27% moderate, and 33% severe strokes. Elevated triglycerides and low HDL cholesterol levels were common, highlighting an adverse lipid profile among the study population. **Conclusion:** This study underscores the high prevalence of traditional cardiovascular risk factors, including hypertension, dyslipidemia, and diabetes, in AIS patients and suggests that hyperuricemia may be a potential marker of stroke risk and severity. The association between SUA levels, diabetes, and metabolic syndrome indicates shared pathophysiological pathways, possibly related to oxidative stress and endothelial dysfunction. Further research is warranted to explore the prognostic value of SUA levels in AIS and their implications for preventive and therapeutic strategies.

Keywords: Acute ischemic stroke, serum uric acid, cardiovascular risk factors, hyperuricemia, stroke severity, dyslipidemia, diabetes, hypertension.

Introduction

Acute ischemic stroke (AIS), or cerebrovascular accident, is characterized by the sudden emergence of a neurological deficit resulting from a localized vascular cause that induces cerebral ischemia. The diagnosis relies on medical history, physical examination, and clinical and laboratory investigations, including brain imaging [1]. It is a primary contributor to adult disability and mortality globally, with a higher incidence in India than in high-income nations [2]. The cumulative

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incidence of stroke varied from 105 to 152 per 100,000 individuals annually, while the crude prevalence ranged from 44.29 to 559 per 100,000 individuals across various regions of the country over the past decade [3]. The stroke mortality rate during the acute phase reaches 20% and remains elevated for several years post-event compared to the general population [4]. Due to the high prevalence and considerable morbidity and mortality linked to AIS, it is essential to identify its risk factors and associated disease indicators to facilitate timely management. Diabetes, hypertension, insulin resistance, tobacco use, obesity, hypercholesterolemia, and physical inactivity have been identified as factors that increase the risk of experiencing acute ischemic stroke (AIS). These risk factors are correlated with elevated serum uric acid (SUA) levels, which have been identified as an independent predictor of stroke [4-6]. Hyperuricemia is associated with dyslipidemia, primarily due to its connection with atheroma pathogenesis, indicating its involvement in AIS [7,8]. Hyperuricemia and a compromised lipid profile are associated with endothelial dysfunction and impaired vascular tone, which may lead to ischemic alterations by allowing cerebrospinal fluid to traverse the blood-brain barrier and induce regions of edema [9-12].

In this study, we aim to analyze the clinicodemographic profile and serum uric acid levels in patients with acute ischemic stroke in a tertiary care center located in central India. Our objective is to investigate the relationship between serum uric acid levels and acute ischemic stroke, as well as to understand how demographic and clinical characteristics (such as age, gender, risk factors, and comorbidities) correlate with stroke presentation and outcomes. This research will contribute to a better understanding of the potential role of serum uric acid as a biomarker for stroke prognosis in the population studied.

Methodology

Study Design

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This research is a cross-sectional study conducted over 18 months, from September 2022 to February 2024, in the Department of General Medicine at Sri Aurobindo Medical College and Postgraduate Institute (SAMC and PGI), Indore, Madhya Pradesh, following approval by the institutional ethical committee.

Study Population

The study population included all patients admitted to the neurology outpatient department (OPD) with acute ischemic stroke, meeting the inclusion and exclusion criteria, and providing informed consent.

Sample Size

A sample size of 100 was targeted based on institutional records, indicating an admission rate of 8-10 ischemic stroke patients per month, amounting to an anticipated minimum of 96 patients over 12 months.

Inclusion Criteria

1. Patients with acute ischemic stroke presenting at the neurology OPD within the study period.

Exclusion Criteria

1. Patients not providing consent.
2. Patients with subarachnoid hemorrhage, extradural hemorrhage, subdural hemorrhage, or intracerebral hemorrhage as excluded by CT.
3. Patients with a prior history of transient ischemic attack (TIA) or reversible ischemic neurologic deficit (RIND).
4. Patients with gout.
5. Alcoholic patients.
6. Patients on medications that may cause hyperuricemia, including loop diuretics, certain anticancer drugs (e.g., cisplatin, cyclosporine, cyclophosphamide), anti-tuberculosis treatments (e.g., pyrazinamide, ethambutol), aspirin, pentamidine, the ophylline, ketoconazole, levodopa, and isotretinoin.
7. Patients with a history of coronary vascular events.

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8. Patients with kidney disease.
9. Patients on medication to reduce oxidant levels.
10. Patients with hypothyroidism.
11. Patients with inflammatory diseases.
12. Patients undergoing steroid therapy.

Data Collection

Data was collected using a pre-structured proforma, which recorded baseline demographics, clinical history, physical examination, and laboratory and radiological investigation results, including:

1. Complete Blood Count (CBC)
2. Serum Uric Acid Levels
3. Fasting Blood Sugar (FBS)
4. CT Brain Imaging

Detailed clinical examinations were conducted for each patient to record clinicodemographic variables and biochemical profiles, which were then correlated with serum uric acid levels.

Statistical Analysis

Data was entered in Microsoft Excel and analyzed as follows:

1. Categorization: Frequency distribution tables were used to categorize demographic and clinical variables.
2. Quantitative Data: Expressed as mean ± standard deviation (SD).
3. Qualitative Data: Expressed in frequencies and percentages.

Results

Table -1 Demographic Profile

Parameter	Value
Total Patients	100
Mean Age (years)	61.17 ± 14.01

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Parameter	Value
Male	63
Female	37
Male to Female Ratio	1.7:1

The demographic profile table presents data on 100 patients with acute ischemic stroke, with a mean age of 61.17 ± 14.01 years. There is a male predominance, with 63 male patients and 37 female patients, resulting in a male-to-female ratio of 1.7:1. This suggests that males are more affected by acute ischemic stroke in the studied population.

Table-2 Risk Factors among Study Participants

Risk Factor	Percentage (%)
Hypertension	65
Diabetes Mellitus	40
Dyslipidemia	55
Smoking	30
Obesity	25
Metabolic Syndrome	35

The risk factors table highlights the prevalence of various conditions among patients with acute ischemic stroke. Hypertension is the most common risk factor, affecting 65% of the patients, followed by dyslipidemia at 55%. Diabetes mellitus is present in 40% of the patients, while metabolic syndrome affects 35%. Smoking

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and obesity are also notable risk factors, with prevalence rates of 30% and 25%, respectively. These findings suggest that hypertension, dyslipidemia, and diabetes are significant contributors to the risk of acute ischemic stroke in this population.

Table- 3 Serum Uric Acid Levels

Parameter	Value
Mean SUA Level (mg/dl)	6.48 ± 1.92
Hyperuricemia (Total Patients)	47 (47%)
Male SUA Level (mg/dl)	6.4 ± 1.5
Female SUA Level (mg/dl)	6.6 ± 1.5

The serum uric acid (SUA) levels table shows that the mean SUA level among patients with acute ischemic stroke is 6.48 ± 1.92 mg/dl. Hyperuricemia, defined as elevated SUA levels, is observed in 47% of the patients. The mean SUA level in males is 6.4 ± 1.5 mg/dl, while in females, it is slightly higher at 6.6 ± 1.5 mg/dl. These findings indicate a high prevalence of hyperuricemia, with similar SUA levels between males and females in the studied population.

Table- 4 SUA Levels and Associated Factors

Factor	SUA Level (mg/dl)
Hypertension	6.42 ± 1.85
Diabetes	6.85 ± 1.86
Obesity	6.48 ± 1.65
Metabolic Syndrome	6.82 ± 1.62
Smoking	6.36 ± 1.78

The table on SUA levels and associated factors shows the mean serum uric acid (SUA) levels among patients with various risk factors. Diabetic patients have the

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highest mean SUA level at 6.85 ± 1.86 mg/dl, followed closely by those with metabolic syndrome at 6.82 ± 1.62 mg/dl. Patients with obesity have a mean SUA level of 6.48 ± 1.65 mg/dl, while those with hypertension have an SUA level of 6.42 ± 1.85 mg/dl. Smokers have a mean SUA level of 6.36 ± 1.78 mg/dl. These results suggest that diabetes and metabolic syndrome are associated with higher SUA levels compared to other factors.

Table- 5 Stroke Severity and Outcomes among Study Participants

Stroke Severity	Number of Patients
Mild (1-4 points)	40
Moderate (5-15 points)	27
Severe (>15 points)	33

The stroke severity and outcomes table categorizes patients based on the severity of their stroke as measured by the NIH stroke scale. Out of 100 patients, 40 experienced a mild stroke (1-4 points), 27 had a moderate stroke (5-15 points), and 33 suffered a severe stroke (>15 points). This distribution indicates that while a significant proportion of patients had mild strokes, a considerable number also experienced moderate to severe strokes, highlighting the varied impact of acute ischemic stroke within the studied group.

Table- 6 Lipid Profile of Study Participants

Parameter	Mean Value
Total Cholesterol (mg/dl)	198.5 ± 45.6
Triglycerides (mg/dl)	205.42 ± 105.08
HDL Cholesterol (mg/dl)	29.80 ± 8.45
LDL Cholesterol (mg/dl)	135.7 ± 39.2

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The lipid profile table shows the mean values of different lipid parameters among the patients. The mean total cholesterol level is 198.5 ± 45.6 mg/dl, while the mean triglyceride level is 205.42 ± 105.08 mg/dl. The mean HDL cholesterol level, which is considered protective, is relatively low at 29.80 ± 8.45 mg/dl, and the mean LDL cholesterol level is 135.7 ± 39.2 mg/dl. These findings indicate a lipid profile characterized by elevated triglycerides and low HDL cholesterol, which are risk factors for cardiovascular events, including stroke.

Discussion

This study investigates the clinico-demographic profile and serum uric acid (SUA) levels in patients with acute ischemic stroke at a tertiary care center. The findings provide insights into the prevalence of risk factors and their association with SUA levels, contributing to our understanding of stroke pathophysiology.

Demographic Profile

The study population consisted of 100 patients with a mean age of 61.17 years, indicating that acute ischemic stroke predominantly affects older adults. The male-to-female ratio of 1.7:1 suggests a higher incidence in males, consistent with previous studies that report a male predominance in stroke occurrence [13,14].

Risk Factors

Hypertension was the most prevalent risk factor, affecting 65% of patients. This aligns with existing literature that identifies hypertension as a significant contributor to stroke risk. Dyslipidemia and diabetes mellitus were also common, affecting 55% and 40% of patients, respectively. These conditions are well-documented risk factors for stroke, as they contribute to atherosclerosis and vascular damage. The presence of metabolic syndrome in 35% of patients highlights the interplay between multiple metabolic disorders in increasing stroke risk.

Serum Uric Acid Levels

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The mean SUA level was 6.48 mg/dl, with hyperuricemia observed in 47% of patients. Elevated SUA levels have been associated with increased oxidative stress and endothelial dysfunction, which may exacerbate ischemic injury . Interestingly, the mean SUA levels were similar between males and females, suggesting that gender may not significantly influence SUA levels in this context.

Association of SUA Levels with Risk Factors

Patients with diabetes and metabolic syndrome exhibited higher mean SUA levels (6.85 mg/dl and 6.82 mg/dl, respectively). This is consistent with studies indicating that insulin resistance and metabolic abnormalities can elevate SUA levels . The association between high SUA levels and these conditions may reflect shared pathophysiological mechanisms, such as impaired renal urate excretion .

Stroke Severity and Outcomes

The distribution of stroke severity showed that while a substantial proportion of patients experienced mild strokes, a significant number had moderate to severe strokes. This variation underscores the heterogeneity in stroke presentations and outcomes, which can be influenced by underlying risk factors and comorbidities .

Lipid Profile

The lipid profile revealed elevated triglycerides and low HDL cholesterol levels among patients. These findings are concerning as they are known risk factors for cardiovascular diseases, including stroke . The low HDL cholesterol level is particularly noteworthy as it is typically protective against atherosclerosis.

In conclusion, this study highlights the significant role of traditional cardiovascular risk factors such as hypertension, dyslipidemia, and diabetes in acute ischemic stroke. The high prevalence of hyperuricemia suggests its potential role as a marker or contributor to stroke pathogenesis. Further research is needed to elucidate the mechanisms linking SUA levels with stroke risk and outcomes.

Conclusion

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This study reveals a significant association between traditional cardiovascular risk factors, such as hypertension, dyslipidemia, and diabetes, and the incidence of AIS in the studied population. The findings indicate that elevated SUA levels are common in AIS patients and are particularly associated with diabetes and metabolic syndrome, suggesting a potential role for SUA as a prognostic biomarker in AIS. The diverse presentation of stroke severity in this cohort emphasizes the influence of comorbidities on clinical outcomes. These insights highlight the importance of screening and managing elevated SUA levels alongside conventional stroke risk factors to improve patient outcomes and may inform future research into SUA's role in AIS pathophysiology and progression.

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