ORIGINAL ARTICLE

COMPARISON OF SERUM URIC ACID LEVELS WITH OUTCOMES IN PATIENTS WITH ACUTE ISCHEMIC STROKE

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ABSTRACT

Objective: To determine the link between uric acid levels and outcome in acute ischemic stroke (infarct).

Study Design: Cross-sectional, observational study.

Place and duration of study: Department of Medicine, Pakistan Ordnance Factories (POF) Hospital, Wah Cantt , 06 months (August 2023 to January 2024).

Methodology: We included 100 patients in our study. All patients underwent serum uric acid level during their admission. After 72 hours, following their admission their Modified Rankin score was calculated and recorded.

Results: The analysis reveals a strong positive correlation between uric acid levels and the Modified Rankin Score (mRS) in acute stroke(infarction). The Pearson correlation coefficient is 0.920, indicating a very high degree of association with p <0.001.

Conclusion: Serum uric acid levels are significantly linked with the Modified Rankin Score while considering the disease outcome in acute cerebral infarction.

Keywords: *Acute Ischemic stroke, Prognosis, Uric acid*

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INTRODUCTION

Stroke, also called Cerebrovascular accident or Acute brain attack is a condition caused by either disruption in the blood flow to the brain or because of rupture of blood vessels leading to a spectrum of various clinical manifestations due to impairment in brain function[1]. Ischemic stroke occurs when the blood supply to the brain is impaired due to the occlusion of the blood vessel supplying that part. The Global burden of disease data revealed very high disease prevalence of stroke and is the second highest cause of mortality worldwide among all the non-communicable disorders with approximately more than 7 million deaths annually[2]. The prognosis of acute stroke is poor with high mortality rates particularly for those requiring intensive care management. Various factors affect the outcomes and the survival rates are poor in those with increase age group and those with severe impairment in their conscious level during the time of admission to the intensive care[3]. Some of the advanced management interventions like re-perfusion therapy and decompressive craniectomy have been found to improve the survival rates in stroke patients. The in-hospital mortality of stroke patients is dependent on many factors like age, complications, severity on admission and resource limitation while deciding appropriate therapy[4]. Delirium has also been found to negatively affect the stroke outcomes with increased risk of complications and higher mortality[5]. Similarly, those non-diabetic patients with stroke who developed hyperglycemia during admission had a bad prognosis compared with those with normal sugars[6].

Hyperuricemia has been found to be an important parameter that is linked with the prognosis and survival in stroke patients. Patients with elevated serum acid are at more risk of developing

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acute stroke with increased mortality rates mediated by the inflammatory mechanisms[7]. Elevated uric levels or Hyperuricemia is an independent risk factor linked with disease severity and progression in cerebral small vessel disease[8]. Therefore, serum uric acid levels, although a simple investigation can be a useful marker in assessment of the disease severity and overall prognosis in patients with acute stroke. The major objective of our study was to determine the association between serum uric acid and stroke outcome in our patient population, with the aim of informing and optimizing future management and preventive strategies.

CAPSULE SUMMARY

A link between uric acid levels and outcome in acute ischemic stroke (infarct) was determined. Serum uric acid levels were significantly linked with the Modified Rankin Score. Serum uric acid levels may prove as a useful biomarker for predicting the severity of disability following a stroke.

METHODOLOGY

We conducted this cross-sectional study in the Department of Medicine, POF Hospital, Wah Cantt, from 10-07-2023 to 09-01-2024 after taking the ethical approval from the hospital ethical review board . A total of 100 patients, between age 18 to 80 years, of both genders who suffered from an acute ischemic stroke presenting with 48 hours of onset of symptoms were included. The diagnosis of stroke was confirmed based on clinical evaluation and CT findings in patients with persistent neurological deficit after 24 hours. Sample size was calculated, using parameters of uric acid in predicting the presence of adverse outcomes in patients with acute ischemic stroke as described by Perveen et al using correlation of coefficient calculated as follows: Level significance: 5%, Power of test: 90%, Correlation of coefficient: r 0.511, Expected sample size: n 100[9]. Consecutive non-probability sampling was utilized. Those with a previous history of CVA, gout, taking urate lowering therapy, alcohol consumers, history of malignancy or taking drugs affecting uric acid levels like Aspirin and diuretics were excluded from the study. Informed consent was obtained from the patients or from their attendants. Serum uric acid levels were checked on admission by taking the blood samples and values expressed in mg/dl. and modified Rankin score was measured after 72 hours of admission. All the data was collected on the proforma and saved.

SPSS v 26 was used for the data analysis. Descriptive statistics was calculated for all variables. Quantitative variables particularly age, height, weight, BMI, serum uric acid level at admission was measured by mean and standard deviation. The modified Rankin score calculated at 72 hours was calculated as mean and standard deviation. A p-value of ≤0.05 was taken as significant. Stratification was also done on the basis of age, gender and BMI, post stratification correlation coefficient was checked.

RESULTS

The mean age of the patients was 57.97±11.66 years (Table-1). Out of 100 patients, 66 (66.0%) were male, while 34 (34.0%) were female (Table-1). The distribution of patients by BMI shows that a majority of the study population, 61.0% had BMI of ≥30 kg/m². The analysis reveals a strong positive correlation between uric acid levels and the Modified Rankin Score (mRS) in people with acute infarct. The Pearson correlation coefficient is 0.920, indicating a very high degree of association, and the p <0.001. The values of uric acid more than 8 mg/dl generally correlate with mRS scores of 4 or higher, indicating a stronger association with more severe disability.

In the younger age group (≤50 years), the Pearson correlation coefficient was 0.954 (p = 0.000), suggestive of positive correlation (Table 5). The stratification by gender revealed significant positive correlations between levels of uric acid and the Modified Rankin Score (mRS) in both males and females which revealed that elevated uric acid is linked with increased disability across genders. In males, the Pearson correlation coefficient was 0.914 (p = 0.000), showing a very strong positive correlation between serum uric acid levels and mRS scores. In females, the correlation was even stronger, with a Pearson

Table 1: Age and Gender distribution

	Number	Percentage(%)
AGE (Years)		
50	27	27
51-80	73	73
	100	100
GENDER		
Male	66	66
Female	34	34
	100	100

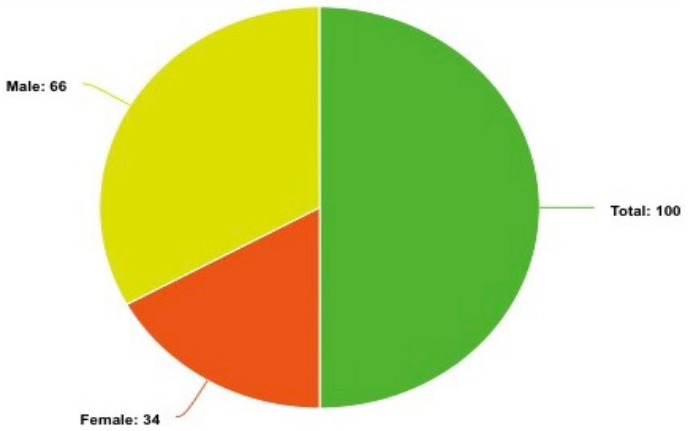

Figure 1: Gender distribution

Table 2: Mean and Standard Deviations of different variables

Variables	Mean	SD
Age (Years)	57.96	11.66
Weight (Kg)	70.2	9.17
Height (cm)	165	7.0
BMI (kg/m2)	36.68	4.92
Uric acid mg/dl	7.71	2.35
mRS	3.48	1.64

Table 3: Stratification for BMI

		BMI < 30 (kg/m2)	Modified Rankin Score (mRS)	BMI ≥30 (kg/m2)	Modified Rankin Score (mRS)
		Uric acid (mg/dl)		Uric acid (mg/dl)	
Uric acid	Pearson Correlation	1	0.943	1	0.905
	Sig. (2-tailed)	0.000	0.000	-	0.000
	N	39	39	61	61
mRS	Pearson Correlation	0.943	1	0.905	1
	Sig. (2-tailed)	0.000	-	0.000	-
	N	39	39	61	61

Table 4: Stratification for Gender

		Male	Modified Rankin Score (mRS)	Female	Modified Rankin Score (mRS)
		Uric acid (mg/dl)		Uric acid (mg/dl)	
Uric acid	Pearson Correlation	1	0.914	1	0.943
	Sig.(2-tailed)	66	0.000	-	0.000
	N	66	66	34	34
mRS	Pearson Correlation	0.914	1	0.943	1
	Sig.(2-tailed)	0.000	-	0.000	-
	N	66	66	34	34

Table 5: Stratification for Age

		Age ≤50 Years	Modified Rankin Score (mRS)	Age51-80 Years	Modified Rankin Score (mRS)
		Uric acid (mg/dl)		Uric acid (mg/dl)	
Uric acid	Pearson Correlation	1	0.954	1	0.893
	Sig. (2-tailed)	-	0.000	-	0.000
	N	27	27	73	73
mRS	Pearson Correlation	0.954	1	0.893	1
	Sig. (2-tailed)	0.000	-	0.000	-
	N	27	27	73	73

correlation coefficient of 0.943 (p = 0.000) as highlighted in the Table 4. The average weight of the patients was 70.20 kg, with a standard deviation of 9.17 kg, indicating moderate variability in body weight. The mean BMI was calculated to be 36.68 kg/m², with a standard deviation of 4.92, 62 indicating that the majority of the population was in the obese category. At admission, the mean serum uric acid level was 7.71 mg/dl with a SD of 2.35 mg/dl suggesting notable variability in uric acid levels among patients. The mean Modified Rankin Score (mRS) was 3.48, with a S.D of 1.64, reflecting a moderate degree of functional impairment in the study population.

DISCUSSION

Our study results revealed a significant link between the high uric acid levels and the stroke outcomes using modified Rankin scale (mRS). We observed that those patients who had high uric acid levels on admission had poor outcomes compared with those having normal levels. A recent study conducted in India also showed that high uric acid levels are linked to more disability risk in acute stroke patients[10] similar to our observations. Hyperuricemia is well recognized entity in chronic inflammatory conditions including the Metabolic syndrome. S Khanna et al reported that the critically ill patients admitted with acute stroke who had high uric acid levels had a high mortality rate with a bad prognosis, both in males and females[11]. These observations were quite similar to our study findings and we found a significant association of hyperuricemia with poor outcome in stroke, both in males as well as female patients. Interestingly, a study that was done to find out the link of stroke severity using NIHSS scale with common biomarkers found no significant link between hyperuricemia and stroke severity[12]. The link of elevated uric acid with stroke prognosis has been remained controversial however majority of the studies showed its detrimental effects on cerebral blood flow via pro-inflammatory mechanisms and some data showing its potential good effects as well[13]. Majority of the patients in our study were obese and hyperuricemia was more frequent in those people, which also suggests hyperuricemia, obesity and bad prognosis of acute ischemic stroke triggered by the inflammation.

Hyperuricemia has been shown to cause various pro inflammatory effects like impairment in endothelial function and insulin resistance[14]. These effects caused by high uric acid leads to increased cell apoptosis and oxidative stress. This in turn causes increased propensity towards development of atherosclerosis. The association of hyperuricemia with stroke prognosis is more in ischemic stroke while most of the studies have shown that the risk of hemorrhagic stroke is not significant[15]. The risk of stroke with hyperuricemia was more in females in one study, however we didn't find any gender related differences in our study[15]. The clinical evidence suggests that urate lowering therapy has a potential role in reducing the cardiovascular risk including stroke and ischemic heart disease[16]. It has also been found that elevated NLR i.e Neutrophil to Lymphocyte ratio in stroke patients has additive effects on uric acid-stroke prognosis association[17]. The risk of cognitive impairment is also high in those patients with acute stroke who have elevated uric acid levels[17]. Recently some studies have also shown the prognostic association of raised serum uric acid in patients with hemorrhagic stroke[18]. A study conducted in Peshawar Pakistan found that elevated serum uric acid levels can be used as predictor of stroke risk highlighting the importance of this useful laboratory test[19]. A longitudinal descriptive study from Bangladesh also revealed uric acid levels as a simple, cheap and convenient method to determine the prognosis in acute stroke patients[20].

Stroke is among the important causes of mortality and affects quality of life both nationally and worldwide therefore our study highlighted the use of an important and simple biomarker, uric acid therefore showing its good potential in improving the prognosis in these patients by timely diagnosis and management of hyperuricemia prior to the development of complications. Serum uric acid is a cost effective and widely available investigation that should be done in patients with

acute cerebral infarct to assess the overall prognosis. The role of elevated uric acid levels has always remained a controversial issue with some studies showing its neuroprotective benefits while majority showing its deleterious effects, that's why we conducted this study to see the effects particularly in our population.

Our study had a few limitations as well. First of all, it was a single centered study with a relatively smaller sample size so results could not be generalized. There may be some confounding effects of obesity as well as majority of our patients were obese. Lack of a control group also makes the validity of results not very high.

CONCLUSION

Elevated uric acid levels are strongly linked to greater disability at 72 hours post admission in patients with stroke. These findings suggest that serum uric acid levels may prove as a useful biomarker for predicting the severity of disability following a stroke. We recommend further larger prospective studies to further strengthen our findings.

ETHICAL APPROVAL: *IRB/POFH/022023/MED/12.*
CONSENT FOR PUBLICATION: *Written, informed consent was obtained from the study participants.*
AVAILABILITY OF DATA: *Data is available from the corresponding author on a justified request.*
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ARTIFICIAL INTELLIGENCE TOOLS DISCLOSURE: *None*
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AUTHORS' CONTRIBUTION

- ***Danial Mateen:*** *Conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article.*
- ***Muzamil Jamil:*** *Conception and design, Analysis and interpretation of data, Drafting the article, Critical revision.*
- ***Syed Asim Ali Shah:*** *Conception and design, Analysis and interpretation of data, Drafting the article, Critical revision.*
- ***Wajahat Sultan Baig:*** *Conception and design, Drafting the article, Critical revision.*
- ***Izza Sohail:*** *Acquisition of data.*
- ***Junaid ur Rehman:*** *Acquisition of data, Analysis and interpretation of data.*

REFERENCES

1. Rajati F, Rajati M, Rasulehvandi R, Kazeminia M. Prevalence of stroke in the elderly: A systematic review and meta-analysis. Interdisciplinary Neurosurgery. 2023 Jun 1;32:101746.
2. Feigin VL, Brainin M, Norrving B, Martins SO, Pandian J, Lindsay P, F Grupper M, Rautalin I. World stroke organization: global stroke fact sheet 2025. International Journal of Stroke. 2025 Feb;20(2):132-44.
3. Carval T, Garret C, Guillon B, Lascarrou JB, Martin M, Lemarié J, Dupeyrat J, Seguin A, Zambon O, Reignier J, Canet E. Outcomes of patients admitted to the ICU for acute stroke: a retrospective cohort. BMC anesthesiology. 2022 Jul 25;22(1):235.
4. van Valburg MK, Arbous MS, Georgieva M, Brealey DA, Singer M, Geerts BF. Clinical predictors of survival and functional outcome of stroke patients admitted to critical care. Critical Care Medicine. 2018 Jul 1;46(7):1085-92.
5. Rollo E, Brunetti V, Scala I, Callea A, Marotta J, Vollono C, Frisullo G, Broccolini A, Calabresi P, Della Marca G. Impact of delirium on the outcome of stroke: a prospective, observational, cohort study. Journal of Neurology. 2022 Dec;269(12):6467-75.
6. Muscari A, Falcone R, Recinella G, Faccioli L, Forti P, Pastore Trossello M, Puddu GM, Spinardi L, Zoli M. Prognostic significance of diabetes and stress hyperglycemia in acute stroke patients. Diabetology & metabolic syndrome. 2022 Aug 29;14(1):126.
7. He Y, You J, Fan Z, Wang Z, Qian M. Inflammation mediates the association between hyperuricemia and stroke mortality: a cohort study. Frontiers in Neurology. 2025 Aug 1;16:1599730.
8. Wei C, Yu X, Wang L, Jiang J, Dai Q, Kang Y, Li J, Chen X. Can hyperuricemia predict the progression risk of cerebral small vessel disease?. Neurological Research. 2022 Oct 3;44(10):910-7.
9. Perveen S, Khalid MA, Ahsan O. Correlation of serum uric acid levels with modified Rankin score in patients with acute ischemic stroke. Pak Armed Forces Med J. 2019;69 (6):1199-1203.
10. Dad GK, Warad VG, Potkar S, Patil S. Association of Serum Uric Acid Level as a Risk Factor and Severity Marker With Acute Ischemic Stroke. Cureus. 2026 Feb 7;18(2).
11. Khanna S, Kumar S, Acharya S, Shukla S, Hulkoti V, Patel M, Gupte Y, Verma P. Serum uric acid as a biomarker in predicting outcome in patients of acute ischemic stroke: A cross-sectional study at limited resources rural setup. International Journal of Nutrition, Pharmacology, Neurological Diseases. 2023 Jan 1;13(1):68-73.
12. Chinnammanavar PK, Somannavar VG, Mohan PB. Role of serum calcium, serum albumin, and serum uric acid as markers of initial neurological severity and short-term outcome indicators in acute ischemic stroke. J. Assoc. Physicians India. 2024 May 1;72:41-4.
13. Bai H, Nie X, Leng X, Wang D, Pan Y, Yan H, Yang Z, Wen M, Pu Y, Zhang Z, Duan W. Increased serum uric acid level is associated with better outcome after endovascular treatment for acute ischemic stroke—a prospective cohort study. Annals of translational medicine. 2022 Oct;10(20):1111.
14. Bahadoran Z, Mirmiran P, Kashfi K, Ghasemi A. Hyperuricemia-induced endothelial insulin resistance: the nitric oxide connection. Pflügers Archiv-European Journal of Physiology. 2022 Jan;474(1):83-98.
15. Roman-Filip I, Roman-Filip C, Morosanu V, Andone S, Bajko Z, Balasa R. Uric Acid in Cerebral Ischemia: A Systematic Review of Its Biomarker Value and Role in Neuroprotection. International Journal of Molecular Sciences. 2025 Oct 22;26(21):10268.
16. Sosa F, Shaban M, Lopez J, Duarte GJ, Jain S, Khizar A, Vittorio T, Mishra R, Rodriguez Guerra M. Impact of hyperuricemia and urate-lowering agents on cardiovascular diseases. Clinical Medicine Insights: Cardiology. 2024 Mar;18:11795468241239542.
17. Xu L, Ouyang QR, Xiong Q, Huang LW, Yu M. Elevated serum uric acid is associated with cognitive impairment in acute minor ischemic stroke patients. Heliyon. 2023 Oct 1;9(10).
18. Wu W, Geng Z, Wu A, Chen X, Meng X, Zhang Q, Tan Z, Yue H, Wu J. Prognostic significance of uric acid levels in intracerebral hemorrhage patients. Neuropsychiatric Disease and Treatment. 2024 Dec 31:449-58.

19. Iqbal A, Ullah Z, Iqbal A, Din QU, Waheed A, Rahman SU. Frequency of Hyperuricemia In Patients Presenting with Acute Ischaemic Stroke: Hyperuricemia in Patients with Acute Ischaemic Stroke. Pakistan Journal of Health Sciences. 2023 Feb 28:22-6.

20. Tabassum M, Uddin MK, Ali MA, Haque SE, Kabir MR, Pramanik MA. Association of Serum Uric Acid Levels in Patients with Acute Ischemic Stroke and Clinical Outcome. TAJ: Journal of Teachers Association. 2022 Aug 10;35(1):63-9.