

Original Research Article

## Association of serum uric acid an independent risk factor in acute ischemic stroke

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**Abstract:** The aim was to study the association between serum uric acid and acute ischemic non embolic stroke. 100 patients of first ever life time acute ischemic stroke admitted in D. Y. Patil hospital were included. The blood samples were taken and CT scans were done within 24 hrs of onset of stroke. Blood samples were sent for biochemical analysis and 2D ECHO was done. The patients were further evaluated for presence of additional risk factors like hypertension, diabetes, adverse lipid profile, smoking and alcoholism. Out of 100 patients 68 were males, 32 were females. 49% were having more than 8mg/dl uric acid level. 53% of them hypertensive and 35% were diabetic. 24% were smokers and 21% were alcoholics. This study shows that elevated uric acid is strongly associated with an increased risk for the development of acute ischemic stroke. Lowering of serum uric acid level can be considered as one of the preventing modalities for stroke while treating high risk population.

**Keywords:** Serum uric acid, acute ischemic stroke

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### INTRODUCTION

Among all the neurological diseases of adult life, the cerebrovascular ones clearly rank the first in frequency and importance. At least 50% of the neurological disorders in a general hospital are of this type. Stroke after heart disease and cancer is the most common cause of death. All the physicians have a role to play in the prevention of stroke by encouraging the reduction in risk factors[1]. Stroke also entails a high socio economic burden due to increased morbidity and mortality[2]. Ischemic strokes account for > 80% of total stroke events. Early identification of individuals at risk could be of help in primary prevention strategies[3]. Uric Acid is the most abundant aqueous antioxidant in humans and contributes as much as two-thirds of all free radical scavenging capacity in plasma. It is particularly effective in quenching hydroxyl, superoxide and peroxynitrite radicals and may serve a protective physiological role by preventing lipid peroxidation[4]. Evidence from epidemiological studies suggests that the elevated SUA levels may predict an increased risk for cerebrovascular (CV) events including stroke[5-7]. Moreover therapeutic modalities with a SUA lowering potential have been shown to reduce CV disease morbidity and mortality[8]. In this respect SUA levels could be used as an easy to measure serum marker in selecting and appropriately treating

subjects at risk[9]. SUA has been recently associated with insulin resistance[10]. Although high SUA levels have been identified as an important risk factor for stroke in unselected populations in a number of epidemiological studies, it is unclear whether high SUA levels promote or protect against the development of CV disease or simply acts as a passive or circumstantial marker of increased risk[11].

### AIM:

To study the association between serum uric acid and independent risk factors leading to acute ischemic stroke.

### OBJECTIVES:

- Find the uric acid levels.
- Study independent risk factors
- Association of the risk factors and the disease

### METHODOLOGY

This was a prospective study which included 100 patients having Acute Ischemic Stroke admitted in Dr. D. Y. PATIL Medical College Hospital & Research Institute, Kadamwadi, and Kolhapur with first-ever-in life time acute ischemic stroke with CTscan evidence of infarction within 24 hrs of onset of stroke done for a period of 2 years from May 2013 to August 2015. To

identify patients with Acute Ischemic Stroke, detailed clinical evaluation, laboratory investigation, and neuroimaging were done. Informed consent was taken from all the respondents. The blood samples were taken within 24 hrs of onset of stroke and sent for biochemical analysis and were analyzed in our Biochemical Laboratory using standard analyzer. The patients were further evaluated for the presence of additional risk factors. Patients with previous history of TIA/CVA, known cases of gout, chronic renal failure, cardiac diseases, and haematological abnormalities, on thiazide diuretics, chemotherapeutic agents, and uricosuric drug, CT scan showing haemorrhage or other space occupying lesions were excluded.

**RESULTS**

Table 1 shows that majority 37% respondents were within age group 60 to 69 years, followed by 27% in 50 to 59 years followed by 15% in 70 to 79 years.

Graph 2 shows the gender distribution among the study population, 68% were males and 32% were females.

Graph 3 shows the uric acid levels, where majority 49% of the patients had levels more than 8,

followed by 26% had within 2 to 8 and 25% had less than 2.

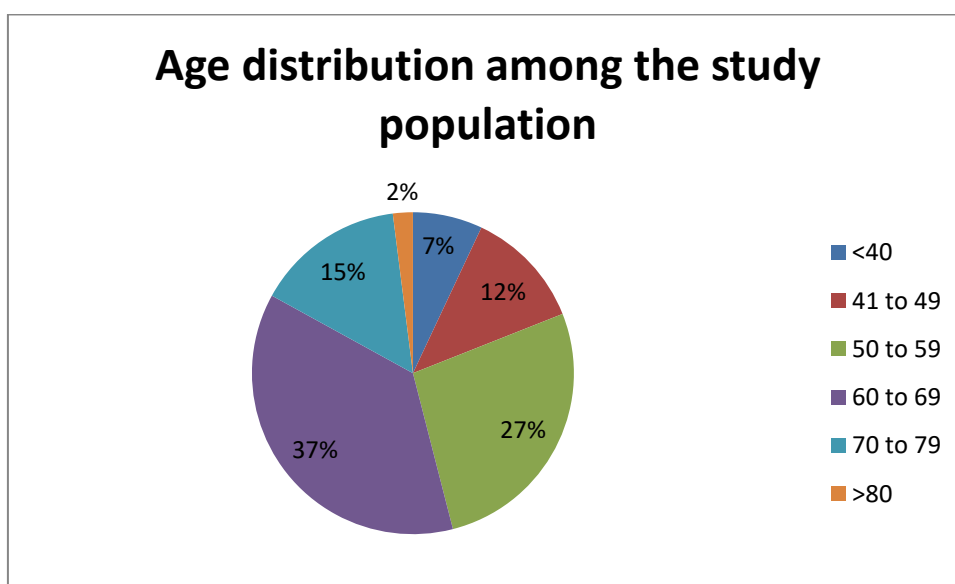
Table 2 shows the association of age and mean uric acid levels among the study population, p value <0.05 which shows the significance.

Table 3 shows the association between uric acid and hypertension, where it was seen that out of total 49 patients having uric acid levels more than 8 mg/dl, there were 34 patients having hypertension. Out of 26 patients having uric acid in range of 2 to 8, 14 patients were having hypertension. Out of 25 having uric acid level less than 2 mg/dl, 5 patients were having hypertension. Chi square test, p value is <0.005, there was high significance.

Table 4 shows association between uric acid and DM, where it was seen that out of total 49 patients having uric acid levels more than 8 mg/dl, there were 22 patient having DM. Out of 26 patients having uric acid in range of 2 to 8, 10 patients were having DM. Out of 25 having uric acid level less than 2 mg/dl, 3 patients were having DM. Chi square test, p value is <0.01, there was significance.

**Table-1: Age distribution among the study population**

Age distribution in years	Frequency	Percentage
<40	7	7%
41 to 49	12	12%
50 to 59	27	27%
60 to 69	37	37%
70 to 79	15	15%
>80	2	2%
Total	100	100%



**Fig 1: Age distribution among the study population**

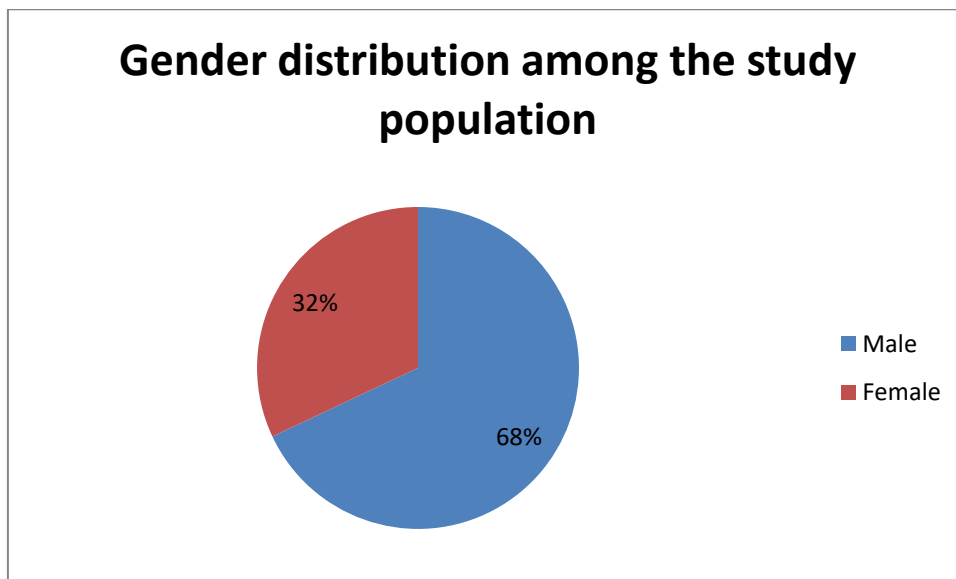


Fig 2: Gender distribution among the study population

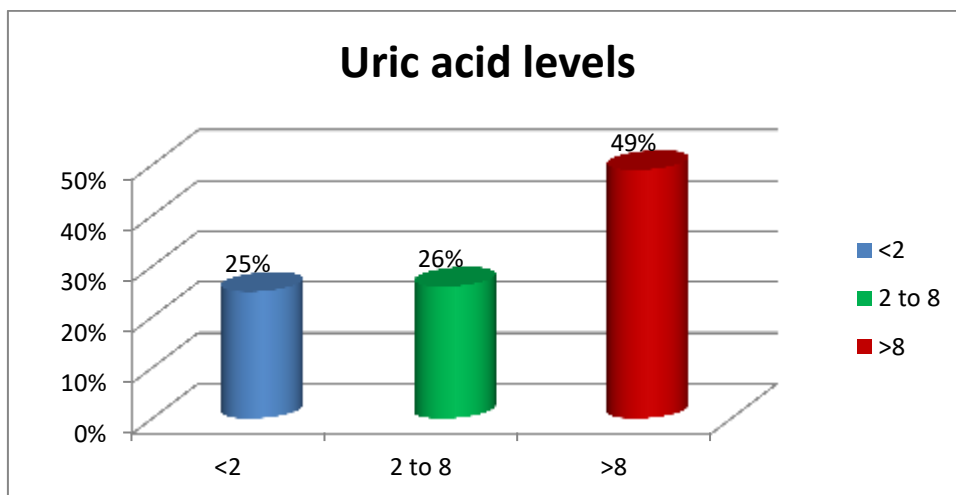


Fig 3: Uric acid levels

Table 2: Association of age and mean uric acid levels among the study population

Age distribution/ uric acid	Mean	SD
<40	4.0	1.0
41 to 49	4.2	1.2
50 to 59	4.9	1.5
60 to 69	5.3	1.53
70 to 79	6.7	1.68
>80	6.3	2.1
P value	<0.05	

Table 3: Association between hypertension and uric acid levels

Uric acid levels /hypertension	Present	Absent	Total
<2	5	20	25
2 to 8	14	12	26
>8	34	15	49
Total	53	47	100

Chi square= 16.22, df=2, p=0.0003

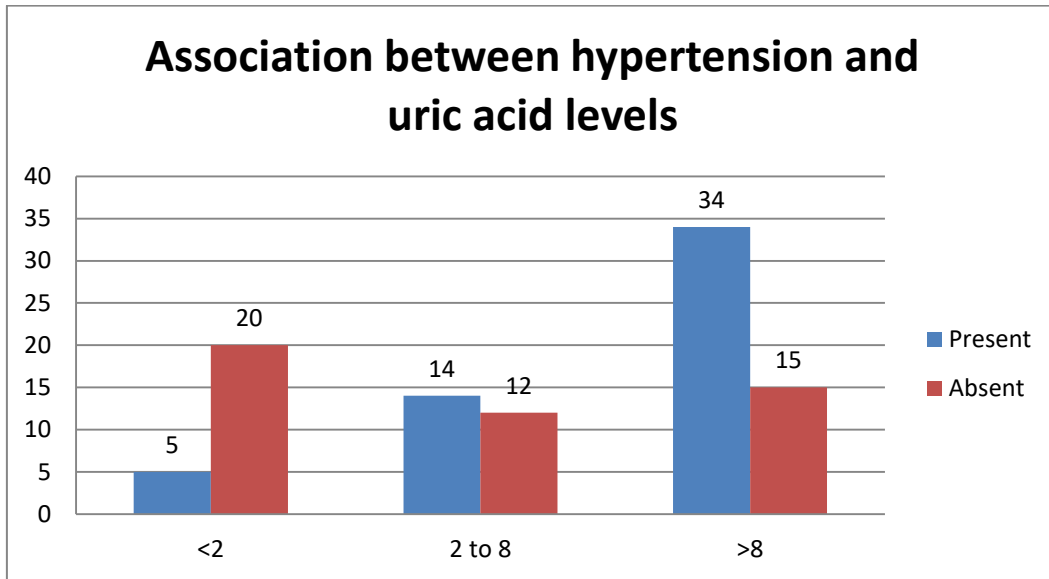


Fig 4: Association between hypertension and uric acid levels

Table 4: Association between uric acid and DM

Uric acid levels /DM	Present	Absent	Total
<2	3	22	25
2 to 8	10	16	26
>8	22	27	49
Total	35	65	100

Chi square=8.06, df= 2, p=0.01

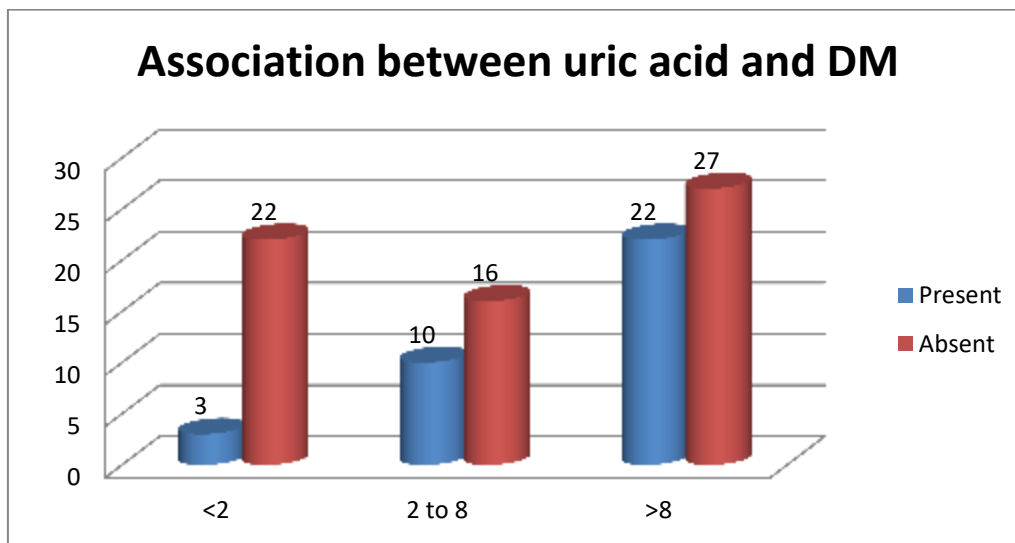


Fig 5: Association between uric acid and DM

**DISCUSSION**

In present study it was seen that majority 37% respondents were within age group 60 to 69 years, followed by 27% in 50 to 59 years followed by 15% in 70 to 79 years. In this study, 25% of the patients are above 65 yrs with 12 male’s and 13 females. Similar findings were seen in present study. Millinois *et al.* [9] concludes that SUA is associated with an increased risk for acute ischaemic/ nonembolic stroke in elderly patients independently of concurrent metabolic

derangements. Present study shows the association between uric acid and hypertension, where it was seen that out of total 49 patients having uric acid levels more than 8 mg/dl, there were 34 patients having hypertension. Out of 26 patients having uric acid in range of 2 to 8, 14 patients were having hypertension. Out of 25 having uric acid level less than 2 mg/dl, 5 patients were having hypertension. Tushar Patil *et al*[12] and Millinois *et al.*[9]; shows similar results. Present study shows DM among the study population,

where 35% of respondents had DM. In this study, with the mean SUA level of 5.98mg/dl among diabetics and 4.88mg/dl among non- diabetics there is a strong association between SUA and DM. In the present study association between uric acid and DM showed that, out of total 35 patients having DM majority of patients, which shows that as the serum uric acid levels were increasing the incidence of stroke was also increasing among the DM patients. In Tushar Patil *et al.*[12]; study there was a statistically significant difference between SUA levels in diabetic and non-diabetic patients. Similar significance was seen between the DM and SUA in present study. Present study showed that the radiological findings on CT scan, where it was seen that majority of patients i.e. 30% were affected in MCA territory followed by 26% PCA territory followed by 18% Infarct in thalamus, followed by 10% Infarct in internal capsule followed by 7% Infarct in caudate nucleus followed by 5 % Infarct in corona radiata followed by 3% Infarct in centrum semiovale and only one percent Infarct in hemisphere. A study by Chamorro A *et al.*[13] showed that neurological impairment on admission (P=0.001) and final infarction size on CT/MRI (P=0.01) were also inversely associated with uric acid.

## CONCLUSION

This study shows that elevated SUA is strongly associated with an increased risk for the development of acute ischemic stroke. The association between elevated SUA and ischemic stroke may need to be considered especially when treating elderly patients, diabetics. Elevated SUA can be considered as one of the risk factors for acute ischemic stroke with associated metabolic diseases like Hypertension and DM. Lowering of SUA level can be considered as one of the preventory modalities for stroke while treating high risk population.

Further studies are required to assess whether lowering of SUA level with life style modification, diet and drugs can eventually reduce the risk of ischemic stroke.

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