

## A STUDY ON SERUM URIC ACID LEVEL AND RISK FACTORS IN NON-EMBOLIC STROKE PATIENT IN TERTIARY CARE HOSPITAL

PARANTHAKAN C<sup>1</sup>, GOVINDARAJAN PK<sup>2\*</sup>

<sup>1</sup>Department of Internal Medicine, Thanjavur Medical College, Thanjavur - 613 004, Tamil Nadu, India. <sup>2</sup>Department of Community Medicine, Raja Muthiah Medical College, Annamalaiuniversity, Annamalaiagar - 608 002, Chidambaram, Cuddalore, Tamil Nadu, India.  
Email: drpkgr@gmail.com

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### ABSTRACT

**Objectives:** To find out the serum level of uric acid among non-embolic stroke patients. To find out the level of uric acid in various risk factors of stroke.

**Methods:** The study was conducted among 100 patients admitted with non-embolic stroke in tertiary care hospital to find out serum level of uric acid and various existing risk factors for non-embolic stroke. The serum level of uric acid was measured within 24 hrs, the demographic profile like age and sex risk factors such as hypertension, diabetes mellitus, dyslipidemia, smoking, and alcohol were elicited. The appropriate statistical analysis was performed.

**Results:** This study was done among 100 patients with non-embolic stroke patients. Out of 100, 63% of the stroke patients were in the age of between 51 and 70 years. Mean age was 59 years. The gender wise distribution was 49% male and 51% female. The mean serum uric acid (SUA) level among all the stroke patients was 5.3 mg/dl. The SUA was increased above the normal level in 33% of the stroke patients. According to univariate analysis, the presence of hypertension was 66% followed by diabetes mellitus 53%. Cardiovascular disease was 33%, dyslipidemia was 40%, smoking was 33%, and alcoholism was 20%. The SUA level was raised above normal level among the patients who had hypertension, diabetes mellitus as a risk factor and it is statistically significant.

**Conclusion:** There is a certain proportion of stroke patient's SUA level raised above normal level and hypertension was a major risk factor for stroke. Secondary prevention of hypertension is mandatory to avoid stroke.

**Keywords:** Serum uric acid, Stroke, Risk factors.

### INTRODUCTION

Among all the neurological diseases of adult life, the cerebrovascular (CV) diseases clearly rank the first in frequency and importance. At least, 50% of the neurological disorders in a general hospital are of this type. Stroke is the third most common cause of death next only to cardiovascular diseases (CVD) and malignancies.

In the developed countries among the 7,00,000 cases of stroke, roughly 6,00,000 are ischemic lesions. All the physicians have a responsibility to prevent the incidence of stroke by encouraging the control of risk factors [1].

Uric acid is an aqueous antioxidant in human and is involved in almost 70% of the free radical scavenging reactions in the human. It is specifically involved in neutralizing peroxynitrite, hydroxyl, and superoxide radicals. It also plays a major role in the prevention of lipid peroxidation [2].

During episodes of ischemic events and oxidative stress due to various causes, the level of local uric acid concentration elevates as a protective mechanism [3]. During experimentation in animals, uric acid levels were found to elevate substantially in response to adverse brain events [4]. Such experiments in lab animals involving middle cerebral artery occlusion lead to a dramatic elevation of local uric acid levels, which remained elevated for a significant period of time following the event [5]. These findings have invoked interest in the prognostic value and uses of elevated uric acid levels in the event of an acute ischemic stroke.

The importance of serum uric acid (SUA) levels as an independent risk factor for stroke is being analyzed recently [6]. One study indicates hyperuricemia is a useful predictor of CV events in elderly diabetic patients independent of the remaining CV risk factors [7].

Although it has been recognized as an important risk factor for CV events in many research studies, it is yet to be confirmed whether high SUA levels have an important role in the etiopathogenesis of CV disease or if it is just a coincidental finding.

Studies like National Health and Nutrition Examination Survey have provided data to support a positive association between SUA and stroke in middle age people, after accounting for other confounding factors [8]. Hence, elevated SUA levels can be quite useful for predicting patients at risk for adverse CV events and to start primary preventive measures. Therefore, it is unclear whether SUA promotes or protects against the development of CV disease or simply acts as a passive marker of increased risk. Amidst this controversy and lack of Indian data, it was decided to carry out the present study with the aim of studying uric acid levels in patients of acute non-ischemic stroke. The rationale behind the study was to understand the association of uric acid with a stroke which may help in the management of stroke.

### Objectives

To find out the serum level of uric acid among non-embolic stroke patients.

To find out the level of uric acid in various risk factors of stroke.

**METHODS**

Study design: Descriptive study.

Study area: Tertiary care Hospital, Thanjavur Medical College, Thanjavur, Tamil Nadu, India.

Study population: 100 patients with non-embolic stroke.

Study period: 1.6.2014 to 31.5.2015.

A total of 100 patients (49 males and 51 females) with acute non-embolic stroke who met the criteria, admitted in TMCH, Thanjavur from 01.06.2014 to 31.05.2015 were included in this study. The informed consent was obtained from the study population, and the study protocol was approved by the Institutional Human Ethical Committee. The blood samples were taken within 24 hrs of onset of stroke and sent for biochemical analysis and were analyzed in institutional Biochemical Laboratory using standard analyzer for serum uric acid, serum glucose, and lipid profile.

The patients were further evaluated for the presence of additional risk factors as follows, using the below-mentioned parameters.

1. Uric acid above the normal level in male >7 and for female was >6 considered as elevated or abnormal.
2. Hypertension
  - a. Known case of hypertension
  - b. Blood pressure more than 140 mm of Hg systolic and/or more than 90 mm of Hg diastolic (62).
3. Diabetes mellitus
  - a. Known case of diabetes mellitus
  - b. Random or postprandial blood sugar more than 200 mg/dl and/or fasting blood sugar more than 126 mg/dl
  - c. The patients with blood sugar values of impaired fasting glucose or impaired glucose tolerance were not included as diabetics in this study.
4. Coronary artery disease  
Patients with electrocardiogram evidence of old infarction or echocardiogram showing regional wall motion abnormalities.
5. Adverse lipid profile  
Total cholesterol - more than 200 mg/dl  
Triglycerides - more than 150 mg/dl  
Low-density lipoprotein-cholesterol - more than 130 mg/dl  
High-density lipoprotein-cholesterol - less than 40 mg/dl
6. Smoking and alcoholism  
History of smoking and alcoholism within the last 5 years have been taken as smokers and alcoholics.

**Inclusion criteria**

1. Patients who were admitted in our hospital with first – ever – in life time acute ischemic nonembolic stroke with or without computed tomography (CT) scan evidence of infarction within 24 hrs of onset of stroke.

**Exclusion criteria**

1. Patients with previous history of transient ischemic attack/ cerebrovascular accident
2. Patients who were on thiazide diuretics
3. Patients who were known cases of gout or show clinical evidences of gout
4. Patients with chronic renal failure
5. Patients whose CT scan showing hemorrhage or other space occupying lesions other than infarct
6. Patients who were of known cardiac diseases which could be sources of emboli or whose echocardiogram shown sources of emboli
7. Patients with hemotological abnormalities like leukemia or other myeloproliferative disorders.

**Statistical tools**

Data analysis was performed with the help of a computer using

Statistical Package for Social Sciences software (SPSS version 22). Using this software, frequencies, percentage, mean, standard deviation,  $\chi^2$  and “p” values were calculated. A p<0.05 is taken to denote significant relationship.

**RESULTS**

This study was done among 100 patients with non-embolic stroke admitted in tertiary care hospital to find out level of SUA and also exiting risk factors among them. Out of 100, 63% of the stroke patients were in the age of between 51 and 70 years (Table 1).

Out of 100, 63% of the stroke patients were in the age of between 51 and 70 years mean age was 59 years.

The gender wise distribution was 49% male and 51% female. The mean SUA level among all the stroke patients was 5.3 mg/dl. Among the non-embolic stroke patients the SUA was increased above the normal level both male and female was 33%. Nearly 78% of hyperuricemia has been found in the age group of above 60 years. Among the stroke patients, 89% had one or other risk factors or multiple risk factors.

Among the risk factors, 30% of the stroke affected patients had hypertension alone, 7% had diabetes mellitus, and 63% had multiple risk factors such as hypertension, diabetes mellitus, CVD, and dyslipidemia. According to univariate analysis, the presence of hypertension was 66% followed by diabetes mellitus 53%, CVD was 33%, dyslipidemia was 40%, smoking was 33%, and alcoholism was 20%. Among the stroke patients 39% had a single risk factor, 31% had two risk factors, and 30% had three or more risk factors.

The level of SUA was raised or abnormal in 58% of the patients among those who had three risk factors, 18% in those who had two risk factors and 15% among those who had one risk factor. This difference in raise in the level of SUA is statistically significant.

Among male 69% of the patients were smokers and 39% were alcoholic. The hyperuricemia was seen in 27% among male and 39% among female, but there is no statistical difference between male and female regarding hyperuricemia. The SUA level was raised above normal level among the patients who had hypertension as a risk factor and it is statistically significant.

The SUA level was raised above normal level also who had risk factor of diabetes mellitus and it is statistically significant. The SUA level also increased in other risk factors but not statistically significant (Table 2).

**Table 1: Distribution of age among study population**

Age in years	Numbers	Percentage
<40		
1-50	21	21
51-60	30	30
61-70	33	33
71<	16	16
Total	100	100

**Table 2: Elevated serum uric acid with various risk factors**

Risk factor	Frequency of elevated uric acid	p value
Hypertension	26	0.004
Diabetes mellitus	26	0.0002
CVD	21	0.0001
Dyslipidemia	17	0.07
Smoking	8	0.82
Alcohol	7	0.8

CVD: Cardiovascular disease

**DISCUSSION**

This present study has found out that the mean age of the stroke was 59 years which is very similar to 60 years a study conducted by Patil *et al.* [9]. The mean SUA of the stroke patients was 5.3 mg/dl in this study which is more or less similar to the mean SUA level 5.94±1.70 mg/dl in a study of Mehrpour *et al.* [10]. The SUA level was raised in 33% of stroke patients according to this study above normal level which is higher than 13% a study conducted by Iranmanesh *et al.* [11] but lower than 47.3% a study conducted by Mehrpour *et al.* [10] and 54.9% by Koppula *et al.* [12].

According to univariate analysis, the presence of risk factors among stroke patients hypertension was 66% followed by diabetes mellitus 53%. CVD was 33%, dyslipidemia was 40%, smoking was 33%, and alcoholism was 20%. These findings closely related with hypertension 55.2%, diabetes 46.3% smokers 40.7% according to a study by Koppula *et al.* [12].

Among the stroke patients 39% had single risk factor, 31% had two risk factors and 30% had three or more risk factors. The level of SUA was raised or abnormal in 58% of the patients among those who had three risk factors, 18% in those who had two risk factors and 15% among those who had one risk factor. This difference in raise in the level of SUA is statistically significant. As per this study, the SUA level was raised above normal level among the patients who had hypertension as a risk factor and it is statistically significant. Milionis *et al.* [13] have found out that SUA level was raised in stroke with hypertension. The SUA level was raised above normal level also who had risk factor of diabetes mellitus and it is statistically significant. Seghieri *et al.*, also found in the diabetic group, serum urate was significantly higher in patients with stroke [14].

**CONCLUSION**

The serum level of uric acid is elevated certain proportion of the stroke patient but not in higher proportion.

The level of uric acid in stroke patients with hypertension and diabetes also significantly have raised. This increase level of uric acid may be considered as marker of stroke. The Hypertension is major risk factor for stroke and it should be controlled in the secondary level of prevention.

**LIMITATION**

This study was not done with a control group and cannot be predicted the SUA is an independent risk factor or associated with stroke.

**REFERENCES**

1. Ropper A, Samuels M, Klein J. Adam and Victor's Principles of Neurology. 8th ed., Ch. 34. New York: McGraw Hill Professional; 2014. p. 660-9.
2. Squadrito GL, Cueto R, Splenser AE, Valavanidis A, Zhang H, Uppu RM, *et al.* Reaction of uric acid with peroxynitrite and implications for the mechanism of neuroprotection by uric acid. Arch Biochem Biophys 2000;376(2):333-7.
3. Nieto FJ, Iribarren C, Gross MD, Comstock GW, Cutler RG. Uric acid and serum antioxidant capacity: A reaction to atherosclerosis? Atherosclerosis 2000;148(1):131-9.
4. Tayag EC, Nair SN, Wahhab S, Katsetos CD, Lighthall JW, Lehmann JC. Cerebral uric acid increases following experimental traumatic brain injury in rat. Brain Res 1996;733(2):287-91.
5. Kanemitsu H, Tamura A, Kirino T, Karasawa S, Sano K, Iwamoto T, *et al.* Xanthine and uric acid levels in rat brain following focal ischemia. J Neurochem 1988;51(6):1882-5.
6. Daskalopoulou SS, Athyros VG, Elisaf M, Mikhailidis DP. Uric acid levels and vascular disease. Curr Med Res Opin 2004;20(3):951-4.
7. Lehto S, Niskanen L, Rönnemaa T, Laakso M. Serum uric acid is a strong predictor of stroke in patients with non-insulin-dependent diabetes mellitus. Stroke 1998;29(18):635-9.
8. Fang J, Alderman MH. Serum uric acid and cardiovascular mortality the NHANES I epidemiologic follow-up study, 1971-1992. National health and nutrition examination survey. JAMA 2000;283:2404-10.
9. Patil TB, Pasari AS, Sargar KM, Shegokar VE, Bansod YV, Patil MB. Serum uric acid levels in acute ischemic stroke: A study of 100 patients. J Neurol Res 2011;1(5):193-200.
10. Mehrpour M, Khuzan M, Najimi N, Motamed MR, Fereshtehnejad SM. Serum uric acid level in acute stroke patients. Med J Islam Repub Iran 2012;26(2):66-72.
11. Iranmanesh F, Sheykhholeslami NZ, Gadari F, Ahmady J. Acute ischemic non-embolic stroke and serum level of uric acid. Iran J Neurol 2012;11(1):1-5.
12. Koppula R, Kaul S, Rao AV, Jyothy A, Munshi A. Association of serum uric acid level with ischemic stroke, stroke subtypes and clinical outcome. Neurol Asia 2013;18(4):349-53.
13. Milionis HJ, Kalantzi KJ, Goudevenos JA, Seferiadis K, Mikhailidis DP, Elisaf MS. Serum uric acid levels and risk for acute ischaemic non-embolic stroke in elderly subjects. J Intern Med 2005;258(5):435-41.
14. Seghieri G, Moruzzo D, Fascetti S, Bambini C, Anichini R, De Bellis A, *et al.* Increase in serum uric acid is selectively associated with stroke in type 2 diabetes. Diabetes Care 2002;25(6):1095.