Serum Uric Acid Level and Severity of Ischemic Stroke

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ABSTRACT

A stroke is the third most common cause of death and the fourth most common cause of infection. Stroke is characterized by the WHO as a clinical condition involving the rapid development of clinical indications of a central aggravation of cerebral capacity lasting more than 24 hours or causing death without a clear reason other than a vascular source. In the present study, a large part of the cases of intense ischemic stroke were found among the males. In the present study, mean cholesterol values, triglyceride values are directly proportional to the severity of the ischemic stroke, among the study subjects. In the present study, 8% cases died, while 92% discharged at home. The current study proved the association of serum uric acid levels with the severity of the acute ischemic stroke.

Keywords: Stroke, WHO, ischemic, serum, uric acid, patient

INTRODUCTION

A stroke is the third most common cause of death and the fourth most common cause of infection. Stroke is characterized by the WHO as a clinical condition involving the rapid development of clinical indications of a central aggravation of cerebral capacity lasting more than 24 hours or causing death without a clear reason other than a vascular source. A transient ischemic attack (TIA) is defined as stroke symptoms and signs that resolve within 24 hours. There are limitations to these definitions. Brain Attack is sometimes used to describe any neurovascular event.[1]

There were very few studies conducted in Indian scenario, which observed the role of serum uric acid in cases of acute ischemic stroke. So the present study aimed at evaluating role of uric acid in assessing severity of acute ischemic stroke.

AIM AND OBJECTIVES

AIM

To study the serum uric acid levels and severity of ischemic stroke patients.

OBJECTIVES

To find out correlation between serum uric acid level and severity of ischemic stroke and to evaluate the serum uric acid levels as a risk factor for ischemic stroke.

REVIEW OF LITERATURE

The thorough review of literature was done by using appropriate MeSH (Medical Subject Headings) terms and operators. Some of the MeSH terms that were used are ischemic stroke, Transient ischemic attack, Clinical presentation, Complications Prognosis and Serum uric acid.

Stroke is described by the WHO as a clinical condition consisting of increasingly evolving clinical symptoms of focal (or global) disruption in cerebral activity lasting longer than 24 hours or contributing to death with no obvious cause other than vascular origin. A transient ischemic attack (TIA) is characterized as signs and symptoms of stroke that resolve within 24 hours. [1][2]

Biyani V et al conducted a research among 100 stroke patients, 68 were males and 32 females. The patients were mostly belonged to the 60-69 years of age group. 49% of the patients had higher SUA levels.[4]

Bhadra J et al. It stated that in 38 patients with ischemic stroke, high SUA levels had a statistically significant correlation with TG and VLDL and inversely correlated with HDL. [5]

Albuker JF et al stated that low HDL cholesterol was associated with an increased risk of stroke. In addition, Sarma D et al, in their research, proved a significant relationship between SUA and TC, TG, LDL. It also indicates a significant negative correlation between uric acid and HDL. [6]

Many researches which compared between outcomes in stroke with SUA levels were published globally.

MATERIALS AND METHODS

Type of study

It is an Analytical, Non interventional Prospective study.

Source of data

Cases of acute ischemic stroke admitted in medicine ward and ICU at Krishna hospital, Karad who fulfilled inclusion criteria were included in present study.

Study duration: 18 months (October 2016 to March 2018)

Sample size: 100 cases

Sample size calculation

With reference to a similar study conducted by Arora T et al where they studied correlation between SUA levels among acute ischemic stroke cases. They observed mean SUA levels as 5.5 ± 1.7 mg/dl among their study subjects. By using above reference values, Sample size was determined utilizing the accompanying formula:

At 95% confidence interval and 20% power, 5% level of significance, sample size was calculated as:

$$n = \frac{z^2 \times SD^2}{d^2} \quad \frac{(1.96)^2 \times (1.7) \times (1.7)}{0.33 \times 0.33}$$

$$n = \frac{10.98}{0.1089} = 100.73$$

$$n = 100$$

where, at 95% confidence interval, Z = 1.96

S.D =1.7mg/dl

d = Precision =0.33

Hence, a sample size of 100 patients with acute ischemic stroke was chosen in the present study.

Inclusion Criteria

Patients with age >18 years. MRI brain/CT brain confirmed cases of acute ischemic stroke.

Exclusion criteria

Patients with known case of cardio-embolic stroke. Past history of valvular heart disease. Patients receiving drugs which are likely to alter serum uric acid levels (diuretics, Losartan, Allopurinol), Malignancy and Renal or liver dysfunction.

Methods

All the required details about cases such as demographic data (Age, gender, address, registration number, etc), clinical presentations (signs & symptoms), general examination findings, systemic examination findings were carried out.

RESULTS

The current study was conducted among 100 patients with acute ischemic stroke admitted to the medicine ward and ICU at Krishna Hospital, Karad.

DEMOGRAPHIC FEATURES

GENDER WISE DISTRIBUTION

Out of total 100 study subjects, there were 76 males (76%) and 24 females (24%). The percentages of male and female are also shown in Table 1. In the present study, there was no significant difference in mean SUA levels between men and women. Average SUA levels between men and women were 4.98 among 1.95 mg / dl and 4.87 among 1.67 mg / dl, respectively.

Table 1: Distribution of patients according to their gender

Gender	(n=100)	Mean serum uric acid levels (mg/dl)
Male	76	4.98±1.95
Female	24	4.87±1.67
Total	100	4.92±1.88

Age wise distribution with serum uric acid levels

In the present study assessment of study subjects according to their age distribution carried out. Majority of the cases belonged to age group of 66-75 years (32%), followed by 56-65 years (28%), and 46-55 years (12%). Only 1 patient is in age group <25.

Comparison between mean serum uric acid levels and age distribution observed that SUA levels were on lower side for younger age group, as compared to elderly. For the age group less than 40 years, mean SUA levels were observed between 4-5 mg/dl, where as it was found above 5 mg/dl above age of 60 years. In the cases with age more than 86 years, mean SUA level was 6.9±1.01 mg/dl.

Table 2: Distribution of patients according to their age

Age groups	(n=100)	Percentage	Mean SUA levels (mg/dl)
<25	1	1%	3.4 ±0 mg/dl
26-35	5	5%	5.38 ±1.13 mg/dl
36-45	3	3%	4.9 ±0.95 mg/dl
46-55	12	12%	4.59 ±1.62 mg/dl
56-65	28	28%	4.42 ±2.10 mg/dl
66-75	32	32%	5.05 ±1.79 mg/dl

76-85	14	14%	5.51 ±2.09 mg/dl
>86	4	4%	6.9 ±1.01 mg/dl
Total	100	100%	4.96 ± 1.88 mg/dl

HYPERTENSION ON ADMISSION

Hypertension is one of a major risk factor for development of stroke. In present study analysis of presence of hypertension on admission among study subjects was carried out. A total 43 patients among 100 were hypertensive while 57 were not. It observed relatively higher (5.17 ± 1.83 mg/dl) mean SUA levels among the patients presented with hypertension at the time of admission as compared to non hypertensives (4.63 ± 1.89 mg/dl). No statistically significant difference was observed in the comparison of mean serum uric acid levels between hypertensive and non-hypertensive patients (t-value: 1.479, p value: 0.35)

Table 3: Comparison of hypertensive status with serum uric acid levels

Hypertension on admission	(n=100)	Percentage	Mean SUA levels (mg/dl)
YES	43	43%	5.17±1.83
NO	57	57%	4.63±1.89
Total	100	100%	4.92±1.88
T-value	1.479		
p-Value	0.35 (not significant)		

SERUM URIC ACID LEVELS

In the present study, serum uric acid levels and its distribution were studied. Mean serum uric acid level was 4.92 acid 1.89 mg / dl. The maximum value was 8.4 mg / dL and the minimum value was 1.2 mg / dL.

In present study majority of the patients had their serum uric acid levels between the range of 3 to 7 mg/dl (67%), followed by 23% patients with SUA levels more than 7 mg/dl, and 10% patients with SUA levels below 3 mg/dl.

Table 4: Serum uric acid level parameters

Serum Uric acid level	Mean value
Minimum	1.2 mg/dl
Maximum	8.4 mg/dl
Mean	4.92 mg/dl
Standard deviation	±1.2 mg/dl

LIPID PROFILE

In order to further evaluate the patients of acute stroke, necessary investigation like Serum uric acid, Total cholesterol, Triglycerides, HDL, VLDL, LDL were carried out. Patients distributed according to laboratory parameters are mention in table 5. Mean total cholesterol level was 168.48 ± 48, mean triglycerides level was 113.93 ± 53 mg/dl, Mean HDL level was 49.1 ± 13.6, mean VLDL level was 26.01 ±16.1 and LDL level was 89.07 ± 40 mg/dl.

Table 5: Mean lipid profile parameters

Laboratory values	Mean value	Standard deviation
Total cholesterol	168.48 mg/dl	±48
Triglycerides	113.93 mg/dl	±53
HDL	49.1 mg/dl	±13.6
VLDL	26.01 mg/dl	±16.1
LDL	89.07 mg/dl	±30

OUTCOMES OF THE STUDY

In the present study, outcomes among the stroke patients were compared with serum uric acid levels. 8 patients in the present study died, while 92% were discharged comparison between mean serum uric acid levels among the patients who died and the patients who discharged observed that mean SUA levels among the patients died is 7.67+ 0.64 mg/dl while it in discharged were 4.68 ±1.75 mg/dl. The variance has been found to be statistically significant (p-value <0.005).

Table 6: Comparison of outcome with serum uric acid levels

Outcome	Number of cases	Percentage	Mean serum uric acid level
Discharged	92	92%	4.68 ±1.75 mg/dl
Died	8	8%	7.67 ±0.64 mg/dl
t-value	t value: 5.067		
p-value	<0.005		

DISCUSSION

The objectives of the present study were the relationship between serum uric acid levels and severity of ischemic stroke. The study included a total of 100 patients with acute ischemic stroke admitted to the Krishna Ward, the Medicine Ward in Karad and the ICU fulfilling the criteria included in the study.

In present study, assessment of various demographic characteristics of the study subjects were carried out. Out of total 100 study subjects, there were 76 males (76%) and 24 females (24%). The ratio of male: female in the present study was 3.16:1. There were no significant difference when serum uric acid levels between males (4.98±1.95 mg/dl) and females (4.87±1.67 mg/dl) were compared.

Kaur IJ et al quoted that mean serum uric acid level in acute ischemic stroke patient was 6.15±1.91 mg/dl and 38% (male 30%, female 50%) of them were hyperuricemic.[7]

Milinin et al stated that serum uric acid levels were associated with increased risk for acute ischemic/nonembolic stroke in elderly patients over 70 years of age independently of concurrent metabolic amputation.[3]

Khalil M et al in their study cited that 68.3% were males and 31.7% were female. Male and female ratio of stroke patients was 2.16:1.[2]

Yu-Fang Wang et cited that 58.7% study subjects were hypertensive. 5.6% cases were having hyperlipidemia.[9]

In the present study, 8 patients died, while 92% patients were discharged. Comparison of mean serum uric acid levels among the patients who died and the patients who discharged observed that mean SUA levels among the patients who died is 7.67 mg/dl, while it in patients discharged were 4.66 mg/dl.

Bansal et al. cited significant relationship between SUA and triglyceride ($P < 0.05$).[10]

In present study assessment of lipid profile parameters of study subjects were compared with severity of the stroke (NIHSS scale). Patients presented with moderate and severe stroke have comparatively higher levels of total cholesterol, triglycerides, VLDL and LDL than patients presented with mild stroke. HDL levels were lower among patients of severe strokes as compared to mild stroke, which observed negative correlation between HDL levels and severity of the stroke.

CONCLUSION

In present study, majority of the cases of acute ischemic stroke were found amongst males. The mean serum uric acid levels tend to increase with the age. Higher serum uric acid values were noted amongst the cases of higher age groups. Almost half of the patients of acute ischemic stroke presented with hypertension at the time of presentation. The levels of serum uric acid amongst hypertensive patients were not found statistically significant than non hypertensive patients. The severity of acute ischemic stroke was proved to be directly proportional to the serum uric acid levels and lipid profile parameters (Cholesterol, Triglycerides, LDL) and inversely proportional to HDL levels.

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