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Original research article

A Study on Serum Uric Acid Level in Acute Ischemic Stroke

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Abstract

Background : Serum Uric Acid at it increased level is major concerned or risk factor for acute stroke patients and use of increased level of serum uric acid as marker of acute ischaemic stroke has debated issue according to some studies conducted in past. Thus we have undertaken this study to know how serum uric acid plays the role among Acute ischemic stroke patients.
Materials and Methodology : This is prospective study conducted on 60 cases of divided into 30 cases (acute ischemic stroke) 30 controls. It was conducted in the department of Medicine at Government Medical College, Siddipet, Telangana State. A detailed history and thorough clinical examination was carried out in each patient. Risk factors for stroke were noted such as hypertension, diabetes mellitus, smoking, and obesity. Serum uric acid levels were measured in cases and controls. Statistical analysis was performed with of SPSS 25 version software.
Results : Among 60 patients of study population 39, were male and 21 were female. , mean age of patients from cases was 58.23 ± 7.32 years and that of in controls was 59.12 ± 8.23 Years. Hypertension and obesity was statistically significant among cases. mean serum uric acid level in cases was 6.85 ± 2.1 mg/dl and that of in controls was 5.42 ± 1.42 mg/dl and it was statistically significant. There was statistically significant difference in mean serum uric acid level in hypertensive and obese patients compared to non hypertensive and non obese.
Conclusion : Increased level of SUA significantly associated with acute phase of an Ischemic stroke.
Keywords: Serum Uric Acid, Acute Ischemic Stroke, Hypertension, Diabetes Mellitus

Introduction

An Emergency condition when there is loss of blood flow to the part of the brain and due to this brain cells do not get sufficient oxygen and nutrients from blood and they start die within a few minutes, such a condition we called it as stroke. In another way we can defined it as cerebrovascular accident is defined as an abrupt onset of a neurologic deficit that is attributable to a focal vascular cause. Early action can reduce the brain haemorrhage and other neurological complications. There are two types of stroke, ischemic stroke and Haemorrhagic stroke. Ischemic stroke can be caused by a blood clot that blocks blood vessel in the brain and about 80% of the strokes are ischemic and it is the most common type. Clots are either thrombotic or embolic, depending on where they develop within the body. A thrombotic stroke, the most common of the two, occurs when a clot forms within an artery in the brain.

The mortality rate of stroke in the acute phase is as high as 20% and it remains higher for several years after the acute event in stroke patients than in the general population.[1] Serum

uric acid being one of the major aqueous antioxidant in human beings should have a protective role in stroke patients. It exists in the extracellular compartment as sodium urate, and it is cleared from the plasma through the kidney [2]. Uric acid levels are influenced by age and sex. Prior to puberty, the average serum uric acid is 3.6 mg/dl for males and females. Following puberty, value rises to adult levels with women typically 1 mg/dl less than men. This lower level in women apparently reflects estrogen related enhancement of renal urate clearance [3]. The role of Serum Uric Acid (SUA) in the development of cardiovascular disease has been debated for over 50 years[4]. Several large studies have provided conflicting results regarding the clinical significance of elevated serum uric acid levels in cardiovascular or cerebrovascular diseases.

Studies conducted by NHANES and many other studies also observed that serum uric acid is an independent factor for development of cerebrovascular and cardiovascular disease. But in contradiction to NHANES and other studies other studies by Framingham heart study observed that "association between hyperuricemia and cardiovascular diseases merely reflects the link between serum uric acid and other risk factors, including hypertension, renal disease, elevated lipoprotein levels and the use of diuretics [3]". Therefore it is unclear whether SUA promotes or protects against the development of cerebrovascular disease or simply acts as a passive marker of increased risk.

Thus we have conducted a study to know how serum uric acid plays the role among Acute ischemic stroke patients.

Materials and Method :
This is a case control study was undertaken in the department of Medicine at Government Medical College, Siddipet, Telangana State, during the period of February 2021 to September 2021. 60 patients were selected for the study and divided into the cases and controls after getting their informed consent and after approval from Institiutional Ethical committee.

Inclusion Criteria:
Cases of acute ischemic stroke admitted to Medicine wards were included in the study.

Exclusion Criteria:
Patients with evidence of haemorrhage or other space occupying lesions other than ischemic infarct in MRI scan, previous history of cerebrovascular accidents, history of intake of thiazide diuretics, complaints of gouty arthritis or clinical evidence of gout, chronic renal failure, haematological abnormalities like leukaemia or other myeloproliferative disorder.

A detailed history and thorough clinical examination was carried out in each patient. Apart from routine investigation, estimation of serum uric acid was carried out in patients reporting to emergency department within 24 hours of onset of symptoms of acute ischemic stroke.

Statistical Analysis:
Collected data were entered in the Microsoft Excel 2016 for further analysis. Qualitative data were expressed in frequency and proportion, that of quantitative data were expressed in mean and standard deviation. Mean difference between cases and controls were assessed by using t-test and association between the two variables were assessed by chi-square test. P-value <0.05 considered as significant at 5% level of significance.

Observation and Results :

Present study included 60 patients divided into cases and controls, mean age of patients from cases was 58.23 ± 7.32 years and that of in controls was 59.12 ± 8.23 Years, gender distribution in cases and controls in the ratio was 18:12 and 21:09 respectively. Obesity, Hypertension, Diabetes and smoking found among the cases in 13, 15, 8 and 6 patients respectively and that of in control it was in 3, 5, 4 and 4 patients respectively as shown in the bellow table 1.

Table 1: Distribution of demographic variables and comorbid condition.

Parameters	Cases	Controls	Chi-square/t-test	DF	P-value
Age	58.23 ± 7.32	59.12 ± 8.23	0.39	58	0.69
Gender (M:F)	18:12	21:09			
Body Mass Index	26.12 ± 1.42	23.32 ± 3.42	4.14**	58	<0.001
Obesity	13	3	8.52**	1	0.003
Hypertension	15	5	7.5**	1	0.006
Diabetes Mellitus	8	4	1.66	1	0.196
Smoking	6	4	0.48	1	0.48

*p-value<0.05, significant and **P-value < 0.05 highly significant at 5% LOS

Table 2: Mean Distribution of serum uric acid.

Groups	Cases	Controls	t-value	DF	P-value
Mean ± SD	6.85 ± 2.1	5.42 ± 1.42	5.03**	58	<0.001
Range	3.4 - 11.1	3.8 - 9			
Median	6.75	5.12			

Table 3: Mean Distribution of serum uric acid among various comorbid condition.

Parameters	SUA (Mean ± SD)	T-value	P-value
Gender			
Male	6.54 ± 1.24	0.38	0.69
Female	6.38 ± 1.89		
Hypertension			
Hypertensive	6.76 ± 1.95	3.03**	0.003
Non-Hypertensive	5.49 ± 1.21		
Diabetic			
Diabetic	6.42 ± 2.12	0.57	0.56
Non-Diabetic	6.72 ± 1.94		
Obesity			
Obese	6.91 ± 1.38	5.29**	0.0001
Non-Obese	5.13 ± 1.22		

Table 4: Mean Distribution of HDL and TGL at different SUA levels.

SUA Interval	HDL (Mean ± SD) mg/dl	TGL (Mean ± SD) mg/dl
< 5	48.89 ± 6.23	132.3 ± 20.23
5.1 - 6	46.32 ± 7.38	139.34 ± 25.2
6.1 - 7	43.85 ± 8.27	148.6 ± 32.4
> 7	40.64 ± 7.35	159.2 ± 42.3

Discussion:

This study was conducted to study the role of serum uric acid in acute ischemic stroke and its effect on stroke outcome.

In the present study, male was dominant over the females, it suggests that male has more ratio of stroke patients than the females, also the age factor was also one of the risk factor among stroke patients. Our results very well consistent with the finding observed by Pandiyan et al[5] who observed male dominance in the study with mean age of the stroke patients was 61.7 ± 13.4 years. Another study by Patil et al, M.Mehrpour, et. al. [6, 7] showed similar results regarding gender and age of the stroke patients. But mean age between the cases and controls also gender distribution was comparable in both the groups. In the study we have observed that obesity and hypertension were statistically significant between the cases and controls.

Mean serum uric acid between the groups was statistically highly significant (P-value<0.01), finding were more consistent with studied by Patil et al[6]. Among the males levels of SUA was more but it was not statistically significant, which was more consistent with studied by Kaur I et al.[8] Study by Pearce et al observed higher serum uric acid values in males as compared to females (5.28±0.66 versus 4.47±0.78 mg/dl).[9]

Many studies found that Hypertension and obesity were most common risk factor for the stroke, in our study also we have observed these factor most common among stroke patients also in hypertensive and obese people levels of serum uric acid level was more and also mean difference between hypertensive and non-hypertensive and obese and non-obese was statistically significant (P-value<0.05). In one of the study it was observed that elevated serum uric acid level is an independent predictor of hypertension in 25 % of patients with new onset untreated primary hypertension.[10] Milionis et al observed that serum uric acid levels were higher in hypertensive subjects compared with nonhypertensives (5.4 ± 1.6 mg/dl versus 5.0 ± 1.6 mg/dl, p= 0.04).[11] Lehto et al also found that the prevalence of hypertension among hyperuricemic subjects was higher as compared to the patients with serum uric acid levels in the normal range (67.3% versus 41.2%, P < 0.001).[12]

We have observed that as the serum uric acid levels increases the mean distribution of HDL was decreasing and TGL levels were increasing. SUA is one of the major aqueous antioxidant in the human beings and constitutes as much as two third of the plasma free radical scavenging ability. It is therefore prudent to expect that SUA should have a protective role in stroke. Various studies have also showed that uric acid can result in endothelial dysfunction which can lead to vascular diseases [13, 14]. SUA can also promote LDL cholesterol in vitro [15]. Further long term prospective studies are needed to establish the role of SUA in ischemic stroke. Also,

trial of SUA lowering drugs in stroke patients as well as in those at increased risk of stroke can be worth considering.

Conclusion:
From above results and observation we can conclude that in patients with acute stroke, there was no significant association between serum uric acid level and diabetes mellitus. Due to the high prevalence of hyperuricemia in patients with acute stroke, and its accompanying increase in triglyceride and LDL cholesterol levels, it can be considered as a risk factor for acute stroke. Thus SUA can be used as a marker of increase risk of stroke.

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Conflict of Interest: None
Ethical Approval: Approved by Institutional Ethical Committee

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