

**ESTIMATION OF SERUM URIC ACID LEVELS IN ACUTE ISCHEMIC STROKE AND TO  
STUDY ITS ASSOCIATION WITH DIABETES MELLITUS AND HYPERTENSION**

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**ABSTRACT**

The role of serum uric acid (SUA) levels as an independent risk factor for vascular disease has been questioned for decades. Recent studies suggest that the elevated SUA levels may predict an increased risk for cerebrovascular (CV) events including stroke. If the levels of other antioxidants like ascorbic acid are low, SUA can work as pro-oxidant. Various studies showed that elevated SUA levels can result in endothelial dysfunction which can lead to vascular disease. An association between SUA and inflammatory markers has also been discovered.

**Keywords::** SUA, Ischemic stroke, Diabetes mellitus, Hypertension

**1.INTRODUCTION**

Cerebrovascular disease is the most common neurological disease of adult life. Atleast 50% of neurological disorders are cerebrovascular disease. After heart disease and cancer, stroke is the third most common cause of death. Cerebrovascular disease accounts for 7.8 million deaths yearly throughout the world and represents about 13% of all causes of death. Due to increased morbidity and mortality, stroke has a high socio economic burden. For primary prevention, at risk individual should be identified early. In humans, most abundant anti oxidant is uric acid and it is the most important of all free radical scavengers in plasma and serve as a protective role by preventing lipid peroxidation. During acute oxidative stress and ischemia local UA concentrations increases in organs and vascular bed, which helps in protection against free radical activity. Diabetic individuals are at two to four times greater risk of

developing atherosclerotic vascular disease. In middle aged individual with diabetes, hyperuricemia is a strong predictor of stroke events. SUA is also been associated with insulin resistance.

The study was done to estimate serum uric acid level in acute ischemic stroke and to study its association with diabetes mellitus and hypertension.

**2.METHODOLOGY**

This study includes 100 patients admitted to RMMCH, Chidambaram with acute ischemic stroke within 24 hrs of onset of symptoms.

Patients with previous history of TIA, CVA, presented after 24 hrs of onset of symptoms, who are on thiazide diuretics, known case of gout & chronic renal failure, whose CT scan shows hemorrhage or other space occupying lesion other than infarct were excluded from study.

A detailed history and thorough clinical examination was carried out. A part from routine investigations, estimation of

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serum uric acid was carried out within 24 hrs onset of symptoms of acute ischemic stroke

Diabetes mellitus ranks second as a risk factor, constitute 52% of the study population with 24 (48 %) males and 28 (56 %) females

### 3.RESULTS

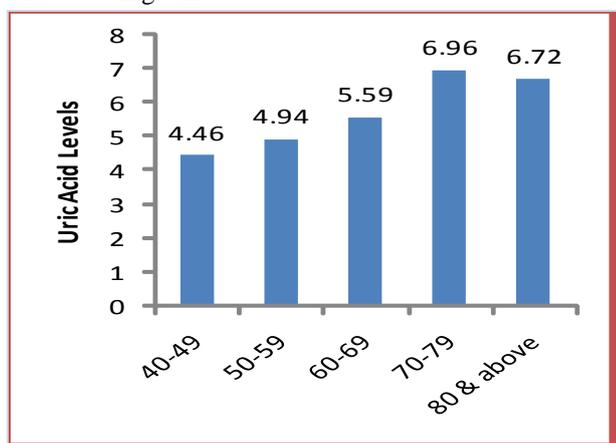
The age of patients in present study ranged from 40 years to 84 years with a mean age of 59.8 years, Male to female ratio being 1:1. Majority of stroke population are between 50 to 69 years (63% of population). The elderly population above 70 years old constitutes 19%.

Age wise distribution of uric acid is found statistically significant. As age advances uric acid also rises. This significance is maintained even when Male and Female population is considered separately. Mean uric acid level in males is 5.42 mg / dl and in females it is 5.49 mg / dl.

Table 1: Age and uric Acid according to Sex

Age group	Uric Acid			
	Males		Females	
	Mean	S.D.	Mean	S.D.
40-49	4.30	1.821	4.48	0.69
50-59	4.91	1.54	4.91	1.30
60-69	5.62	1.66	5.54	1.50
70-79	6.88	2.21	7.02	1.54
80& above	8.40	0.00	5.60	1.50
'p'	0.008		0.005	
	Significant		Significant	

The mean uric acid value for 40 – 49 yrs group is 4.46 mg /dl while the elderly age group of above 70 yrs has the mean value 6.84 mg / dl.



Graph – I: Age and Uric Acid

Hypertension constitutes the major risk factor in this stroke population as 64 % of the population is hypertensive. 34 males and 30 females are hypertensives and form 68 % and 60 % in their respective population.

Table 2: Risk Factors according to sex

Risk Factor	Cases			
	Males		Females	
	No.	%	No.	%
<b>a) Hypertension</b>				
Present	34	68	30	60
Absent	16	32	20	40
<b>b) DM</b>				
Present	24	48	28	56
Absent	26	52	22	44

Table 3: Hypertension and uric acid – sex wise

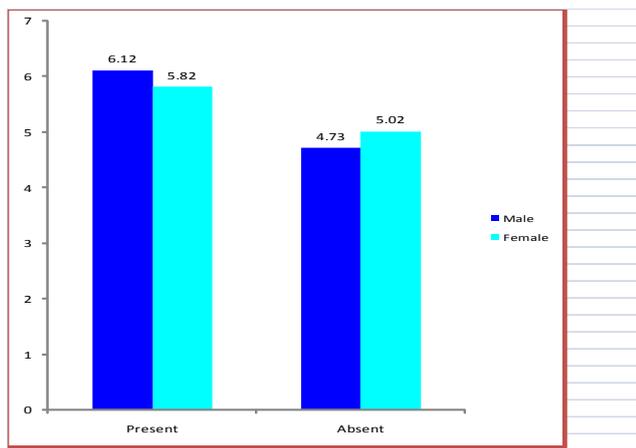
Hypertension	Uric Acid (mg / dl )			
	Males		Females	
	Mean	S.D	Mean	S.D
Present	5.48	1.75	5.77	1.65
Absent	5.23	2.17	5.02	1.23
	0.669		0.090	
P	Not Significant		Not Significant	

This study does not show any significant association between hypertension and uric acid and also when males and females are considered separately. The mean uric acid level in hypertensive population is 5.64 mg / dl and in non hypertensive population is 5.11 mg/ dl.

There is a statistically significant association found between the level of uric acid and Diabetes mellitus and it is more significant among males. Among diabetics the mean uric acid value is 5.96 mg / dl while among non diabetics it is 4.9 mg / dl.

Table 4: DM and Uric acid according to sex

DM	Uric Acid (mg / dl)			
	Males		Females	
	Mean	S.D	Mean	S.D
Present	6.12	1.82	5.82	1.48
Absent	4.73	1.70	5.02	1.49
	0.008		0.067	
P	Significant		Not Significant	



Graph – I: DM and Uric Acid according to sex

#### 4.DISCUSSION

The mortality rate of stroke in the acute phase is as high as 20%. Stroke remains an important cause of morbidity and long term disability; Uric acid is a final end product of purine metabolism. Long been considered only in the pathogenesis of gout and uric acid stones. Its role in the pathogenesis of hypertension, cardiovascular, cerebrovascular and its anti-oxidant functions events are been considered of late. Serum uric acid levels in vascular events have proven its prognostic significance in recent studies. Uric acid is also been considered as a marker for atherosclerosis. An association between SUA and inflammatory markers has also been discovered.

In a study by Daskalopoulou et al., (2004) found a positive correlation between uric acid levels and asymptomatic carotid atherosclerosis. Uric acid level can be used to predict future cerebrovascular events.

A study by Fang and Alderman, (2004) also showed increased uric acid levels in patients with ischemic stroke. In a study by Lehto et al., (1998) among African patients found that uric acid levels were elevated among stroke patients.

Age is the most common non-modifiable risk factor for the development of stroke. The mean age of the male population is 59.08yrs and of the female population is 60.5 yrs. Age wise distribution of uric acid is found statistically significant and the association was maintained even when both sexes are considered separately. Our study is consistent with Milinois et al who found elevated SUA in individuals older than 70 years. Hypertension is the most common modifiable risk factor for stroke. In our study, Hypertension constitutes the major risk factor as 64 % of the stroke population is hypertensive. The mean uric acid level of hypertensive patients is 5.64 mgs / dl and of nonhypertensive is 5.11 mgs / dl and thus this study does not show any statistically significant relationship between SUA and hypertension. In a study by Verdecchia et al., (2000) proved a relation between serum uric acid and essential hypertension.

A study by Franeesea Viazzi et al., (2005) found that cerebrovascular events was higher in hypertensives with increased uric acid level.

Diabetes mellitus ranks second as a risk factor in our study, constitute 52 % of the study population. Mean SUA level is 5.96 mgs / dl among diabetics and 4.90 mgs / dl among non-diabetics found statistically significant. Further analysis shows stronger association among males (mean SUA in male diabetics -6.12 mgs/dl vs non-diabetic males- 4.73 mgs/dl) than females.

Lehto et al.(1998) prospective study revealed elevated uric acid in diabetics who develop stroke. In a study by Wang, Lim et al. showed that hyperglycemia increases stroke mortality and another study by Yoon and Zheng, (2005) found high blood glucose is associated with poor outcome after ischemic stroke.

#### 5.CONCLUSION

Elevated SUA is strongly associated with an increased risk for the development of acute ischemic stroke in this study population. The association between elevated SUA and ischemic stroke may need to be considered especially when treating elderly patients, diabetics. Uric acid has been considered as a surrogate biochemical markers of oxidative stress in acute ischemic stroke. Elevated uric acid among stroke patients concurred with previous publication. It is also suggested that further studies are required to assess whether lowering of SUA level with drugs can actually reduce the risk of ischemic stroke.

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