Original Research Article

Clinical profile of ischemic stroke and its correlation with serum uric acid: a cross sectional study

Hemant Lakhmawad, Nalini Humaney*

Department of Medicine, NKP Salve Institute of Medical Sciences Nagpur, Maharashtra, India

*Correspondence:
Dr. Nalini Humaney,
E-mail: hemantlakhmawad@gmail.com

ABSTRACT

Background: Stroke is the third most common cause of mortality if considered separately from other cardiovascular diseases across the world. Uric acid also has neuro protective effect and has been postulated in increased risk of insulin resistance and cardiovascular risk. With this background, conducted a study to understand the clinical profile of ischemic stroke and its correlation with serum uric acid in setup.

Materials and Methods: A cross sectional study was carried out in a tertiary care hospital from October 2016 to September 2018. A total of 75 patients with history of acute stroke were included in the study after obtaining informed consent. Clinical data including demographic data, age and sex of the patients was taken. Also, history of diseases like diabetes mellitus, hypertension and Ischemic Heart Disease was noted. Relevant investigations were done and noted.

Results: The mean age of the study subjects was 57.53 ± 10.23 years with male preponderance. The mean body mass index was 26.58 ± 2.86 in our study. Risk factors like hypertension were present in 70.67%, TIA was present in 6.67%, 22.67% had diabetes mellitus and smoking was present in 48% of the patients. About 54.67% of the subjects had high uric acid levels in our study. Not found any significant relation between the uric acid levels and different risk factors.

Conclusion: The average age of the ischemic stroke incidence was between 5th to 6th decades in the present study. Males had higher risk when compared females which were consistent with various studies conducted across the world. Not found any significant association between the uric acid levels and various risk factors for ischemic stroke. Uric acid was found to higher among these patients.

Keywords: Ischemic stroke, Uric acid, Clinical profile

INTRODUCTION

Stroke is the third most common cause of mortality if considered separately from other cardiovascular diseases across the world.[1] It is second most common cause of disability and dementia among ages more than or equal to 65 years of age. The estimated incidence rate of stroke is 119-145 per lakh based on the recent population-based studies.[2,3] Uric acid is final catabolite of purine metabolism among humans. It usually exists as sodium urate and excreted through kidneys. Age and gender have a significant influence over the uric acid levels[4]. Studies suggest that uric acid levels are associated with increased cardiovascular risk. The basic pathology postulated is elevation of serum triglyceride levels and cholesterol along with hypertension, insulin resistance and metabolic syndrome. Uric acid also has neuro protective effect due to its internal quality of being a free radical scavenger.[4-6] Serum uric acid levels and its association with the ischemic stroke are poorly understood. Hence, conducted a study to understand the role of serum uric acid among

the patients with ischemic stroke attending tertiary care hospital.

METHODS

A cross sectional study was carried out in a tertiary care hospital from October 2016 to September 2018. A total of 75 patients with history of acute stroke were included in the study after obtaining informed consent. Clinical data including demographic data, age and sex of the patients was taken. Also, history of diseases like diabetes mellitus, hypertension and ischemic heart disease was noted. Baseline blood pressure of the patients was recorded. Blood sample was taken from all patients with acute stroke on admission to check uric acid level, fasting blood sugar and lipid profile. Further, all patients were subjected to echocardiography and fundoscopy. A study conducted by Mehrpour M. et al inferred that the 47.3% of their subjects had hyperuricemia associated with ischemic stroke patients.[7] Using this prevalence, with 95% confidence interval and 11% absolute error got the minimum sample size to be 71. Included 75 study subjects in this study. The patients with chronic kidney disease, chronic liver disease, with malignancy, with history of trauma and gout, history of drug intake like diuretics, antioxidants and anti-neoplastic drugs and recent history of myocardial infarction have been excluded from the study sample. The study has been approved by the institutional ethics committee of the tertiary care institute and the concerned university authorities.

Statistical analysis

Data was collected, compiled, and analysed using Epi Info version 7.2. The qualitative data was expressed using percentages. The quantitative data was expressed in terms of mean and standard deviation. The difference between the two proportions was analysed using fisher's exact/ chi-square test. The difference between two means has been analysed using unpaired t test. All analysis was two tailed and the significance level was set at 0.05.

RESULTS

Included 75 cases of ischemic stroke in the present study.

The mean age of the study subjects was 57.53 ± 10.23 years with male preponderance. Majority of the subjects were in the range of 51 to 60 years. About 30.67% were normal body mass index, 54.67% were overweight and 14.67% were obese in the present study. The mean body mass index was 26.58 ± 2.86 in this study. Risk factors like hypertension were present in 70.67%, TIA was present in 6.67%, 22.67% had diabetes mellitus and smoking was present in 48% of the patients.

About 54.67% of the subjects had high uric acid levels in this study. The mean uric acid level was 6.30 ± 1.53 mg/dl.

Table 1: Demographic particulars of the study sample.

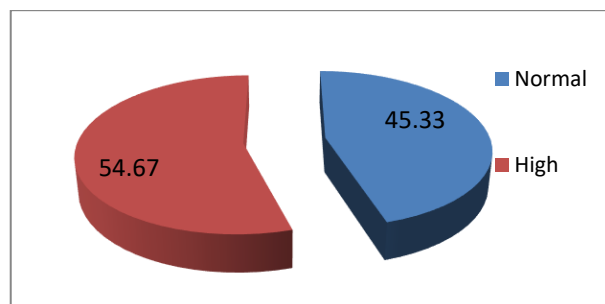| Demographic Parameters	Frequency	Percentage (%)
Age (in years)		
<40	2	2.67
41 to 50	22	29.33
51 to 60	24	32.00
61 to 70	22	29.33
>70	5	6.67
Gender		
Females	33	44.00
Males	42	56.00
Body mass index		
<18.5	0	0
18.5 to 24.99	23	30.67
25 to 29.99	41	54.67
>30	11	14.67
Risk factors		
Hypertension	53	70.67
Transient ischemic attack	5	6.67
Smoking	36	48.00
Diabetes mellitus	17	22.67

Figure 1: Distribution of the study subjects based on the uric acid levels.

About 68% of the subjects had abnormal total cholesterol, 98.67% had abnormal LDL, about 13.33% had abnormal HDL and 68% had abnormal triglycerides. Based on 2D ECHO, 53% were abnormal and based on ECG, 53% had left ventricular hypertrophy. About 13.33% had retinopathy in this study. The CT findings suggested that 50.67% had right middle cerebellar, 48% had left middle cerebellar and 1.33% had other site involved.

The mean uric acid levels among the patients with hypertension were 6.31 ± 1.61 and without hypertension were 6.29 ± 1.38 and this difference was not significant. The mean uric acid levels among the patients with history of smoking were 6.27 ± 1.71 and without history of smoking were 6.24 ± 1.38 and this difference was not significant.

Table 2: Distribution of the study subjects based on the investigations.

Lipid profile	Normal		Abnormal	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Total cholesterol	24	32.00	51	68.00
LDL cholesterol	1	1.33	74	98.67
HDL cholesterol	65	86.67	10	13.33
Triglycerides	24	32.00	51	68.00
Other investigations	Frequency		Percentage (%)	
ECG				
LVH	53		70.67	
Normal	22		29.33	
Fundus				
Retinopathy	10		13.33	
Normal	65		86.67	
2D ECHO				
Abnormal	53		70.67	
Normal	22		29.33	
CT findings				
Right middle cerebellar	38		50.67	
Left middle cerebellar	36		48.00	
Others	1		1.33	

Table 3: Distribution of the study subjects based on different parameters and uric acid levels.

Different parameters	Uric acid levels		P value
	Mean	SD	
Hypertension			
Absent	6.29	1.38	0.9609
Present	6.31	1.61	
Smoking			
Absent	6.24	1.38	0.8002
Present	6.27	1.71	
Diabetes mellitus			
Absent	6.22	1.67	0.9167
Present	6.28	1.78	
Obese/Overweight			
Absent	6.13	1.48	0.1404
Present	6.69	1.54	
LDL			
Normal	5.30	---	--
Abnormal	6.31	1.54	
HDL			
Normal	6.26	1.57	0.9303
Abnormal	6.34	1.38	
TG			
Normal	6.15	1.63	0.5549
Abnormal	6.37	1.50	

The mean uric acid levels among the patients with diabetes mellitus were 6.28±1.78 and without diabetes mellitus were 6.22±1.67 and this difference was not significant. The mean uric acid levels among the patients with obesity/overweight were 6.69±1.78 and without obesity/overweight were 6.13±1.48 and this difference was not significant. The mean uric acid levels among the patients with normal HDL were 6.26±1.57 and with abnormal HDL were 6.34±1.38 and this difference was not significant. The mean uric acid levels among the patients with normal TG were 6.15±1.63 and with abnormal TG were 6.37±1.50 and this difference was not significant. The mean uric acid levels among the patients with normal LDL were 5.30±0.00 and with abnormal

LDL were 6.31±1.54 and this difference was not significant.

DISCUSSION

Stroke is the third most common cause of death in the world after coronary artery disease and cancer. Uric acid levels have been postulated in various studies to have been associated with metabolic syndrome, insulin resistance and stroke.[3-6] With this background conducted a study to understand the clinical profile of ischemic stroke patients and their correlation with various risk factors. The mean age of the study subjects was 57.53±10.23 years with male preponderance. Similar inferences were drawn by studies conducted by Wang et al, Paranthakan et al, Kaur et al, Koppula et al, Patil et al and Suman et al.[8-12]

The most common risk factor associated with ischemic stroke in the present study was hypertension among 70.67% of cases, 48% had history of smoking and 22.67% had history of diabetes. A study done by Wang YF et al reported that about 35% of their study had history of smoking, 58.7% had hypertension and 17.5% had history of alcohol consumption.[8] Paranthakan et al reported that 30% of their study subjects had hypertension as a risk factor and 26% had diabetes mellitus.[9]

Milionis et al inferred that the rates of hypertension in their study was 47.2%, the proportion of smoking was 26.4% in their study.[14] Patil TB and workers reported that the proportion of hypertension was 51%, smoking history was present in 20%, 23% had diabetes mellitus and obesity was present in 44% of their study subjects.[12] Charan Reddy et al reported that 28% were hypertensives, 24% had smoking history and 16% were dyslipidemic in their study.[15]

Did not find any significant difference of uric acid levels among the different risk factors for ischemic stroke. Chamorro et al inferred that the mean uric acid levels in hypertensive and non-hypertensive in their study were 5.35±1.88 and 4.83±1.56 respectively and this difference was statistically significant.[16] Further, among smokers and non-smokers the uric acid levels were 5.24±1.72 and 5.10±1.80 and this difference was not significant. Among the dyslipidemic patients the uric acid levels were 5.21±1.70 and among those who did not have dyslipidemia the levels were 5.11±1.81 and this difference was not statistically significant.

Paranthakan et al reported that the uric acid levels were significantly higher in hypertensives, with history of CVD, dyslipidemia and smoking when compared to their counterparts.[9] Strohaug et al reported that as the different parameters like body mass index, systolic blood pressure, diastolic blood pressure, triglycerides, total cholesterol and LDL levels increases the uric acid levels also increased significantly and this trend was statistically significant.[17] It implies higher body mass index, systolic blood pressure, diastolic blood pressure, triglycerides, total cholesterol and LDL levels has higher uric acid levels in their body.

Milionis et al reported the mean uric acid levels among patients with hypertension and without hypertension were 5.4±1.6 and 5.00±1.6 levels respectively and this difference was statistically significant.[14] Further, the mean uric acid levels in overweight patients were higher when compared to normal weight patients but this difference was not significant. They also reported that the mean uric acid levels in patients with metabolic syndrome were 5.6±1.7 and without metabolic syndrome it was 5.0±1.6 levels and this difference was not significant. Kaur et al reported that they found a non-significant difference between the serum uric acid levels hypertensive and dyslipidemic patients when compared with their counterparts.[10]

Mehrpour et al reported that the uric acid levels were significantly higher in abnormal triglyceride levels and abnormal LDL level when compared to the respective lower levels.[7] Tripathi VD and colleagues reported that uric acid levels were significantly higher in hypertensives when compared to non-hypertensives in their study.[18] Mangal AC et al reported that the mean uric acid levels in hypertensive patients was 6.30 ± 2.64 and among non-hypertensives was 6.19 ± 2.85 levels and this difference was not significant.[19] The proportion of hyperuricemia in patients with hyperlipidaemia was higher when compared to normal lipid levels and no statistical difference was found in their study. Behera et al reported a significantly higher uric acid levels in hypertensives, overweight and smokers in their study.[20]

The present study had some limitations. It was a single center cross sectional study prospective analytical studies would have yielded better results. Nonetheless, this is one of the studies which adds to the knowledge of role of uric acid in ischemic stroke in this region.

CONCLUSION

The average age of the ischemic stroke incidence was between 5th to 6th decades in the present study. Males had higher risk when compared females which were consistent with various studies conducted across the world. Hypertension was most common risk factor present in the present study. Did not find any significant association between the uric acid levels and various risk factors for ischemic stroke. Uric acid was found to higher among these patients. With this can infer that uric acid levels have to be monitored among the patients with ischemic stroke patients.

REFERENCES

1. World Health Organization-Cerebrovascular accident Fact sheet; 2014. Available from: https://www.who.int/ topics/ cerebrovascular accident/en/. Accessed on 15 July 2020.
2. Benjamin EJ, Blaha MJ, Chiuve SE, Cushman M, Das SR, Deo R et al. Heart Disease and Stroke Statistics-2017 Update: A Report from the American Heart Association. Circulation. 2017;135(10):146-603.
3. Feigin VL, Norrving B, Mensah GA. Global burden of stroke. Circ Res. 2017;120(3):439-48.
4. Dimitroula HV, Hatzitolios AI, Karvounis HI. The role of uric acid in stroke: the issue remains unresolved. Neurologist. 2008;14(4):238-42.
5. Kuklina EV, Tong X, George MG, Bansil P. Epidemiology and prevention of stroke: a worldwide perspective. Expert Rev Neurother. 2012;12(2):199-208.
6. Chamorro Á, Obach V, Cervera Á, Revilla M, Deulofeu R, Aponte JH. Prognostic Significance of Uric Acid Serum Concentration in Patients with Acute Ischemic Stroke. Stroke. 2002;33:1048-53.
7. Mehrpour M, Khuzan M, Najimi N, Motamed MR. Serum uric acid level in acute stroke patients. Med J Islam Repub Iran. 2012;26(2):66-72.
8. Wang YF, Li JX, Sun XS, Lai R, Sheng WL. High serum uric acid levels are a protective factor against unfavorable neurological functional outcome in patients with ischemic stroke. J Int Med Res. 2018;46(5):1826-38.
9. Paranthakan C, Govindarajan PK. A study on serum uric acid level and risk factors in non-embolic stroke patient in tertiary care hospital. Asian J Pharm Clin Res. 2016;9(3):300-2.
10. Kaur I, Khurana A, Sachdev JK, Mohan G. Evaluation of serum uric acid in acute ischaemic stroke. Int J Adv Med. 2017;4(1):60-5.
11. Koppula R, Kaul S, Venkateswar Rao A, 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.
12. 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(9):193-200.
13. Suman GR, Awati AM, Krishnamurthy L, Patil B. Predication of Ischemic Stroke with Serum Uric Acid as Biomarker in Diabetes Mellitus-2. IOSR J Den Med Sci. 2016;15(6):96-101.
14. Milionis HJ, Kalantzi KJ, Goudevenos JA, Seferiadis K. Serum uric acid levels and risk for acute ischaemic nonembolic stroke in elderly subjects. J Intern Med. 2005;258(5):435-41.
15. Charan Reddy KV, Ghanekar J. Prognostic Significance of Serum Uric Acid and Mortality Outcomes in Patients with Acute Cerebrovascular Ischemic Stroke. Int J Stroke Res. 2014;2(1):6-14.
16. Chamorro Á, Obach V, Cervera Á, Revilla M, Deulofeu R, Aponte JH. Prognostic Significance of Uric Acid Serum Concentration in Patients with Acute Ischemic Stroke. Stroke. 2002;33:1048-53.
17. Storhaug HM, Norvik J V, Toft I, Eriksen BO, Løchen M, Zykova S et al. Uric acid is a risk factor for ischemic stroke and all-cause mortality in the general population: a gender specific analysis from The Tromso Study. BMC Cardiovasc Disord. 2013;13:115.
18. Tripathi VD, Hussain Z. A study to find out relationship in between serum uric acid level and stroke. 2017;4(5):1255-9.
19. Mangal A, Guria R, Singh M. Serum uric acid in acute ischemic stroke. J Evol Med Dent Sci 2013;2(36):6915-26.
20. Behera BK, Hui PK, Simethy R. Serum uric acid level in acute ischemic stroke in eastern India. Int J Res Med Sci. 2017;5(6):2353-7.