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Serum Uric Acid Level in Acute Stroke Patient: Study of 100 Cases

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Abstract **Original Research Article**

Background: The role of serum uric acid (SUA) levels as an independent risk factor for vascular disease has been questioned for decades. Epidemiological evidence shows that greater SUA levels may predict an increased risk of cardiovascular (CV) events, such as Stroke. Hyperuricemia has long been linked to cardiovascular illness, hypertension, metabolic syndrome, and kidney disease. ***Material and Methods:*** The study was conducted at Dhaka Medical College Hospital from July 2010 to December 2010. This study included one hundred first-time stroke patients, both male, and female (non-pregnant), who fulfill the inclusion criteria. It was a prospective observational study. A purposive sampling technique was used. Fifty-nine percent of the patients were male, and the rests were female. About 85% of them were Muslim. ***Result:*** The mean age of the patients was 62.3 years with an SD ± 9.078 years. Patients from the age group 51-60 years formed the main bulk, followed by 61-70 years group (36% and 33% respectively). The mean value of serum uric acid was found as 7.108 mg/dl (SD ± 2.292), which was clearly above the normal limit. The mean value of Random Blood Sugar was 7.45 mg/dl with SD ± 3.292 (n=86), and for Serum Creatinine, the mean and SD value were 0.898 and 0.2108, respectively, which are within the normal limit. Lipid profiles were checked in 93 patients. It was shown that the Cholesterol level was much higher than the normal value, but other parameters were somewhat normal and about half of the male respondents were hypertensive. The prevalence of hypertension in females was little more than their male counterparts. The study revealed that about 24% of all male stroke patients suffered from DM, whereas females were 17%. This difference was not statistically significant. ***Conclusion:*** Right-sided hemorrhagic CVD topped the tally in both sexes, followed by left-sided hemorrhagic CVD. The prevalence of Ischemic CVD was found to be a little lower. The present study suggests that high serum uric acid levels may be associated with increased risk of stroke incidence and mortality.

Keywords: Stroke, Hyperuricaemia, Hyperlipidemia.

INTRODUCTION

Stroke is a non-communicable illness that is becoming increasingly important to society as the population ages, particularly among the elderly. Stroke was the second most common cause of death globally in 1990, and the third most prevalent cause of death in more industrialized nations; it was responsible for around 4–4 million deaths globally. Stroke has a significant impact on the economy because of the high morbidity and mortality rate [1]. In addition to long-term impairment, Stroke is a major cause of emotional and economic effects for patients, their families, and health care providers. Primary preventive techniques can be more effectively developed if people at risk (such as those with diabetes or hypertension) are identified early [2]. When uric acid levels in the blood are abnormally high [3], a condition known as hyperuricemia, it can be an indication of a variety of health conditions, including alcoholism; acidosis; gout; diabetes; lead poisoning; hypoparathyroidism (low levels of the hormone parathyroid in the body); kidney stones; leukemia; renal failure; polycythemia vera (a rare bone marrow disorder); toxemia of pregnancy;

renal failure; chemotherapy [4]. There are several possible explanations for a lower-than-normal concentration of uric acid in the blood: Fanconi syndrome, Wilson's illness, low-purine diet use, or sodium deficiency in the form of SIADH [5].

Serum uric acid (SUA) levels have been debated for decades as an independent risk factor for cardiovascular disease. A serum urate content of more than 6.8 mg/dl, which is the upper limit of urate solubility in serum, is considered hyperuricemia. Uric acid levels that are regarded as excessively high are up for discussion [6]. Uric acid's normal values have been discovered to vary substantially in recent years. Reference values: Serum Uric Acid- Adult males: 2.0 - 7.5 mg/dl, adult females: 2.0 - 6.5 mg/dl. Evidence from epidemiological studies suggests that elevated SUA levels may predict an increased risk for cardiovascular (CV) events, including stroke [7].

Moreover, therapeutic modalities with an SUA-lowering potential have been shown to reduce CV disease morbidity and mortality [8]. SUA levels might be utilized in this way as a serum marker that is "simple to assess" to help identify at-risk individuals and treat them properly. A significant opportunity exists for uric acid and derivatives to have a role in illness prevention or modification [9].

Purine metabolism is principally responsible for the generation of uric acid as a byproduct. Nucleic acids are the primary source of the body's uric acid; however, dietary purine consumption accounts for a lower fraction of the overall uric acid generation. When you urinate, you flush off uric acid [10]. The mechanism by which hyperuricemia is related to atherosclerotic disease is unclear. One hypothesis is that hyperuricemia increases stroke risk by association with stroke risk factors. Hyperuricaemia may perpetuate hypertension by causing renal injury disrupting the rennin-angiotensin system [11]. It is also linked to insulin resistance/metabolic syndrome [12] and low HDL cholesterol levels [14]. Direct effects of UA on vascular physiology have also been explored. Elevated UA levels are associated with increased arterial stiffness, endothelial dysfunction, and blunted vasodilatory response [13]. UA may contribute to endothelial dysfunction by promoting LDL-C oxidation, stimulating granulocyte adherence, and promoting macrophage infiltration of the vascular wall [14].

Although UA is typically an antioxidant, some authors have suggested that it can take on pro-oxidant properties under certain conditions [15]. The link between uric acid and Stroke is less clear. Some authors have suggested that elevated uric acid levels are closely associated with stroke risk factors, and therefore hyperuricemia is a marker in patients at high risk for Stroke [16]. Others contend that uric acid is an independent risk factor for Stroke and is directly involved with the pathophysiology of cerebrovascular disease [17]. Even when other cardiovascular risk factors are controlled for, a significant association between Stroke and hyperuricemia remains, indicating that UA levels may be an independent predictor of stroke risk and not just a marker for a disease state. Worldwide extensive research is conducted on this subject. The present study was undertaken to identify the link between serum uric acid and Stroke.

SUBJECTS AND METHODS

A total of 100 patients aged older than 40 years (59% of the patients were male, and the rest 41% were female) diagnosed as first ever in a lifetime acute ischemic/ no embolic stroke were included in the study. Criteria for inclusion in the study were - Subjects aged 18 – 80 years, patients admitted in the medicine ward of Dhaka Medical College Hospital with first-ever Stroke, provided informed consent, and non-pregnant females.

For this study, we excluded people who have had a history of cardiovascular disease (such as a previous heart attack or a stroke), kidney or liver disease, excessive alcohol consumption, and neoplasia, as well as Stroke patients who had known cardiac emboli source (such as atrial fibrillation, heart valve disease, or anticoagulant treatment). Patients who refused to give their consent were also excluded.

The study was approved by the Institutional Ethics Committee after all participants provided informed with permission. Patients with high blood pressure were identified based on their medical history and current medications. Within 24 hours after the beginning of the Stroke, all biochemical assays were carried out using commercially available standardized procedures. A complete blood count and a serum biochemistry analysis were performed as part of the laboratory inquiry (creatinine, urea, electrolytes, uric acid). After an overnight fast, the subjects tested their blood for glucose and lipids.

RESULTS

Prospective observational research was conducted to examine the relationship between serum uric acid (SUA) levels and stroke risk at medicine in the patient Department of Dhaka Medical College Hospital from July 2010 to December 2010. A total of 100 patients were enrolled in the study.

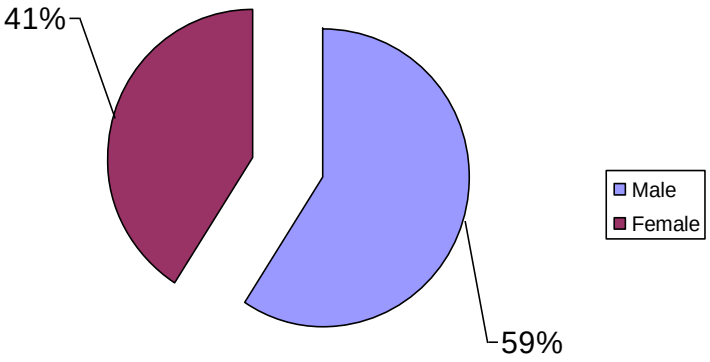

Fig 1: Distribution of the patients by Sex

Fig 1 shows the gender of the patients. A total of 59% of the patients were male, and the rest 41% were female. There is slight male predominance among the total patients.

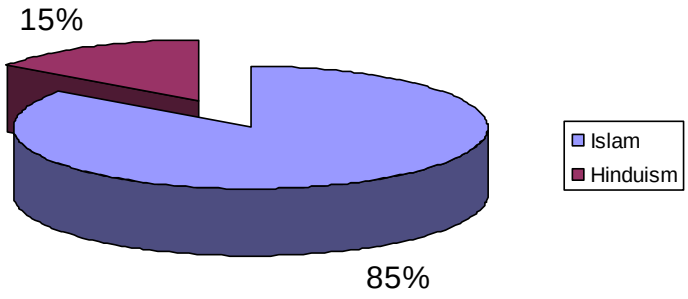

Fig 2: Distribution of the patients by religion

Fig 2 depicted the patients' religion status, which showed 85% of the patients were Muslim and the rest 15% were Hindus.

Table 1: Distribution of the patients by Occupation

Occupation	Frequency	Percent
Business	21	21.0
Service holder	14	14.0
Retired/Aged person	13	13.0
Farmer	5	5.0
Daily worker	4	4.0
Teacher	2	2.0
Social Worker	2	2.0
Housewife	39	39.0
Total	100	100.0

Table 1 shows the Occupational status of the patients. Large numbers of respondents were businessmen (21%), followed by service holders (14%). A considerable portion of the respondents (13%) were retired from their jobs. Most of the female patients were housewives (39%).

Table 2: Distribution of the patients by age group

Age group (yrs.)	Frequency	Percent	Mean	± SD
<=40	1	1.0	62.30	9.078
41-50	9	9.0		
51-60	36	36.0		
61-70	33	33.0		
71-80	21	21.0		
Total	100	100.0		

Table 2 shows Patients from the age group 51-60 years formed the main bulk, followed by 61-70 years group (36% and 33% respectively). The mean age of the patients was 62.3 years with an SD ± 9.078 years (Table 2).

Table 3: Some of the laboratory tests performed

Name of tests	N	Mean	± SD
Serum Uric Acid	100	7.1080	2.29242
Random Blood Sugar	86	7.4474	3.2927
Serum Creatinine	19	0.8984	0.21085

Uric Acid. The mean value was 7.108 mg/dl with SD ± 2.292. The mean value of Random Blood Sugar was 7.45 mg/dl with SD ± 3.292 (n=86), and for Serum Creatinine, the mean and SD value were 0.898 and 0.2108, respectively (Table 3).

Table 4: Lipid profiles of the patients

Serum Lipid Profile	N	Mean	± SD
Cholesterol	93	257.98	55.491
Triglyceride	93	186.66	45.207
HDL	93	37.89	18.045
LDL	93	140.08	34.79

Table 4 shows Out of 100 patients, 93 performed the test for Lipid profiles. It was shown that the Cholesterol level was much higher than the normal value, but other parameters were somewhat normal (Table 4).

Table 5: Distribution of the patients by the status of Diabetes Mellitus and Sex

Diabetes Mellitus	Sex				Total	
	Male		Female			
	N	%	n	%	N	%
Positive	14	23.73	7	17.07	21	21.0
Negative	45	76.27	34	82.93	79	79.0
Total	59	100.0	41	100.0	100	100.0

Table 5 shows the distribution of the patients by presence or absence of Diabetes Mellitus by Sex. About 24% of all male stroke patients suffered from DM, whereas 17% of the female patients were suffering from the same. This difference was not statistically significant.

Table 6: Distribution of the patients by Hypertension state and Sex

Hypertension	Sex				Total	
	Male		Female			
	n	%	n	%	n	%
Positive	30	50.85	24	58.54	54	54.0
Negative	29	49.15	17	41.46	46	46.0
Total	59	100.0	41	100.0	100	100.0

Table 6 shows almost half of the male stroke patients were suffering from hypertension, and half were not. In females, the percentage of hypertension-positive patients (59%) was somewhat higher than non-sufferers (Table 6).

Table 7: Distribution of the patients by Status of Serum Uric Acid and Sex

Serum Uric Acid	Sex				Total	
	Male		Female			
	N	%	n	%	N	%
Positive (>6.8 mg/dl)	35	59.32	23	56.10	58	58.0
Negative	24	40.68	18	43.90	42	42.0
Total	59	100.0	41	100.0	100	100.0

Table 7 shows the distribution of the patients by presence or absence of hyperuricemia by Sex. About 59% of all male stroke patients had high serum uric acid, whereas 56% of the female patients had the same. Out of 100 patients, 58% got high serum uric acid levels.

Table 8: Distribution of the patients by CT scan findings and Sex

CT scan	Sex				Total	
	Male		Female			
	n	%	n	%	N	%
Intracerebral Rt sided infraction	13	22.03	9	21.95	22	22.0
Intracerebral Lt sided infraction	11	18.64	11	26.83	22	22.0
Intracerebral Rt sided hemorrhage	15	25.42	8	19.51	23	23.0
Intracerebral Lt sided hemorrhage	20	33.90	13	31.71	33	33.0
Total	59	100.0	41	100.0	100	100.0

Table 8 shows the distribution of the patients by CT scan findings and Sex. Intracerebral left-sided hemorrhage topped the list (34% and 32%, respectively). In both sexes, Intracerebral right-sided hemorrhage came next.

DISCUSSION

A study on 100 acute stroke patients was undertaken to see the serum uric acid level at medicine in the patient department of Dhaka Medical College Hospital from July 2010 to December 2010. As stated in the title, non-probability sampling was used to choose 100 participants for the research. Fifty-nine percent of the patients were men, while the other patients were all women. About 85% of them were Muslim. Sex and religion distributions were quite normal for Bangladesh. The mean age of the patients was 62.3 years with an SD ± 9.078 years. Patients from the age group 51-60 years formed the main bulk, followed by the 61-70 years group (36% and 33% respectively). These findings were also quite normal as Cerebro Vascular Diseases predominantly occur later in life.

Humans produce uric acid as a byproduct of purine metabolism. A serum urate content of more than 6.8 mg/dl, which is the limit of urate solubility in serum, is commonly used to characterize hyperuricemia [6, 18]. In the present study mean value of serum uric acid was found as 7.108 mg/dl (SD ± 2.292), which was clearly above the normal limit. This finding is identical to the Rotterdam study [19]. Out of 100 patients, 58% of the patients got high serum uric acid levels. The mean value of Random Blood Sugar was 7.45 mg/dl with SD ± 3.292 (n=86), and for Serum Creatinine, the mean and SD values were 0.898 and 0.2108, respectively, which are within the normal limit in line with some other international studies [20]. It is widely believed that hyperlipidemia and hypertension are closely associated with the development of Stroke in humans. To test this hypothesis, lipid profiles were checked in 93 patients. It was shown that the Cholesterol level was much higher than the normal value, but other parameters were somewhat normal (Table 4); about half of the male respondents were patients of hypertension. The prevalence of hypertension in females was little more than their male counterparts.

High serum glucose levels above normal can complicate the situation even more. The study revealed that about 24% of all male stroke patients were suffering from DM, whereas 17% of the female patients were suffering from the same. This supports association between diabetes mellitus and Stroke [21]. About 59% of all male stroke patients had high serum uric acid, whereas 56% of the female patients had the same. This difference was not statistically significant. Out of 100 patients, 58% got high serum uric acid levels. Right-sided hemorrhagic CVD topped the tally in both sexes, followed by left-sided hemorrhagic CVD. The prevalence of Ischaemic CVD was found to be a little lower. No statistical significance was found for these variations [22].

Limitation of the study

The study was conducted at Dhaka Medical College Hospital from July 2010 to December 2010. One hundred first-time stroke patients were included in this study. Certainly, a wider study conducted in different hospital settings would reveal more information; but constrained, more elaborate studies could not be done due to time and resources. To follow up patient till its final outcome more time was

necessary. The variables which were considered most important were included in the present study; few are omitted due to time shortness. The study would be more representative if it included other relevant variables.

CONCLUSION

Many studies have associated a high blood uric acid level with cardiovascular illness, including hypertension, coronary heart disease, peripheral vascular disease, and Stroke, regardless of whether the patient has gout [23]. Higher levels of UA in the blood were shown to be linked to an increased risk of Stroke in the study's findings. However, there is some debate as to whether or not having a high blood uric acid level is a risk factor in and of itself for cardiovascular disease and Stroke [24]. According to the findings of this study, high levels of serum uric acid may be linked to an increased risk of Stroke and, as a result, death. In order to determine if uric acid has a role in hypertension, vascular disease, atherosclerosis, and strokes, further research is needed. Lowering uric acid levels will also need to be studied to see whether that has any effect on the frequency of strokes. The pathogenetic processes of hyperuricemia should be confirmed, and the function of urate-lowering medication in Stroke should be examined in a future study.

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