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Original Article

Prevalence of Hyperuricemia In Acute Ischemic Stroke Patients: A Cross-Sectional Study

Madiha Haseeb[1], Maria Qadri[2], Mir Tahir Hussain Talpur[3], Muhammad Azhar Hussain[4], Nasir Jamil[4], Farah Malik[4], Areeba Zohaib[1], Neha Aslam[5] and Mohammad Hasan[1*]

[1]Department of Medicine, Jinnah Postgraduate Medical Centre, Karachi, Pakistan
[2]Sindh Government, Pakistan
[3]Department of Medicine, People's University of Medical and Health Sciences for Women, Nawabshah, Pakistan
[4]Department of Medicine, Liaquat College of Medicine & Dentistry, Karachi, Pakistan
[5]Karachi Medical & Dental College, Karachi, Pakistan

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***Corresponding Author:**
Mohammad Hasan
Department of Medicine, Jinnah Postgraduate Medical Centre, Karachi, Pakistan
m_hasan_96@yahoo.com

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ABSTRACT

Ischemic stroke is responsible for a significant proportion of stroke cases, with stroke being a major contributor to mortality and morbidity on a global scale. **Objective:** To check the relation of hyperuricemia with stroke. **Methods:** A cross-sectional study was carried out in the Jinnah Post-graduate Medical Center's Medicine ward more than six months after the acceptance of the synopsis. This study was conducted between 2020 and 2021. The sample size for the study was determined to be at least 94. Non-probability consecutive sampling was employed to select patients aged >20 years, of either sex, who were diagnosed with acute ischemic stroke. Patients with ischemic stroke due to a known thrombophilic condition and those with hyperuricemia secondary to high cell turnover from cancer chemotherapy were excluded from the study. The frequencies and percentages were collected and calculated and chi-square was used to evaluate the significance. The p-value of <0.005 was considered significant. **Results:** We enrolled 94 patients in total. Table 1 shows the demographics of the patients who presented to the hospital. The most common age group was >60 years and the majority of the patients were male (61.7%). The 51 (54.2%) patients have a BMI >25. 65 (69.1%) of the patients had diabetes. The relationship between the patients with hyperuricemia with the male gender, hypertensive patients, and patients who smoke with a p-value of <0.001. **Conclusions:** In conclusion, hyperuricemia appears to be prevalent in acute ischemic stroke patients, especially among the elderly population.

INTRODUCTION

Ischemic stroke is responsible for a significant proportion of stroke cases, with stroke being a major contributor to mortality and morbidity on a global scale [1]. A focal vascular cause that results in cerebral ischemia is an acute ischemic stroke (AIS), sometimes referred to as a cerebrovascular event. It can be identified by the quick onset of the neurologic impairment [2]. Several factors like the patient's history and general physical examination, clinical and laboratory investigations, and brain imaging, can make the diagnosis of this condition [3]. The fatality rate from stroke during the acute phase may surpass 20% when compared to the general population, and it remains elevated for several years even after the acute incidence [3]. Numerous etiologies have been related to a higher chance of developing AIS, including diabetes, hypertension, insulin resistance, smoking, being overweight, having high cholesterol, and not exercising. Higher blood levels of uric acid, which have also been

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referred to as a reliable parameter to predict stroke, have been associated with these risk variables [4, 5]. The presence of raised uric acid levels within the bloodstream, known as hyperuricemia, has been recognized as a plausible risk element for stroke [2]. Uric acid is a byproduct generated through the metabolic degradation of purines within the human body and is typically eliminated via renal excretion [6]. Individuals with hyperuricemia exhibit elevated uric acid levels due to increased production or decreased excretion. This condition may result in the formation of urate crystals in joints and tissues, ultimately leading to inflammation and damage Increases in the consumption of foods high in purines and sugar-sweetened beverages, as well as in the incidence of overweight and obesity, may all be contributing factors to the steady rise in blood uric acid levels [7, 8]. They are eliminated from the body through the kidneys. Age and sex correlate with the fluctuations in the levels of uric acid. Before adolescence, both males and females should have their uric acid levels within the normal range of 3.6 mg/dl [9]. Various types of research have explored the correlation between hyperuricemia and stroke; however, the findings have been incongruous. The link between hyperuricemia and stroke risk has been the subject of numerous research, with various degrees of success [10]. While some studies have found a significant association, others have not, and some studies have reported a positive association [11, 12]. Hyperuricemia and deranged lipid profiles are associated with endothelial dysfunction and reduced vascular tone, which may be related to ischemic changes, allowing CSF to cross the blood-brain barrier and result in areas of edema [13, 14]. Whether serum uric acid increases the risk of developing acute ischemic cerebrovascular illness or acts as a warning indication of that risk is currently unknown and needs additional study. This study has recommended analyzing the severity and clinical prognosis of stroke patients in connection to their serum uric acid levels.

METHODS

A cross-sectional study was conducted in the Medicine ward of Jinnah Post-graduate Medical Center, over 6 months after obtaining approval of the synopsis. The sample proportions for the research were determined to be at least 94, calculated using the Raosoft sample size calculator software. This study was conducted between June 2020 and Feb 2021. The study utilized a Confidence Interval Strength of 95% and an Absolute Precision of 8%, with an anticipated proportion of hyperuricemia in people who have had an acute brain stroke 123 patients [15]. Non-probability consecutive sampling was employed to select patients aged >20 years, of either sex, who were diagnosed with acute ischemic stroke. Patients with ischemic stroke due to a known thrombophilic condition and those with hyperuricemia secondary to high cell turnover from cancer chemotherapy were excluded from the study. We sought ethical approval from the ethical research committee of the hospital before commencing the study, and all recruited patients provided written informed consent. The eligible patients in the department were enrolled in the study after receiving a thorough explanation of the study's purpose and its details. The diagnosis of acute ischemic stroke was made by physicians based on predefined acute ischemic diagnosis criteria. Blood samples were drawn from the patients to evaluate the levels of uric acid in the laboratory, and their medical history regarding elevated uric acid in the past was also recorded. In addition, an assessment of other risk factors for cerebrovascular disease, including hypertension, fasting blood glucose, HbA1c levels, diabetes history, smoking history, and fasting lipid profile, was conducted to identify potential confounders or effect modifiers. The information was collected systematically using a proforma and then entered into IBM Corp.'s SPSS Version 20.0 (Armonk, New York, USA) for evaluation. For the relevant variables (sex and Child-Pugh classification), frequency tables were created. Age and weight variables' means and standard deviations were computed. The statistical significance of any proportion of patients with HRS was assessed using the chi-square test. The p-value with <0.05 was taken as statistically significant. The general conclusions were connected to the findings of the study. The study aims to provide insights into the occurrence of high levels of uric acid in patients with acute ischemic stroke. By analyzing the collected data, the research aims to contribute valuable information that may aid in developing effective prevention and management strategies for hyperuricemia and its association with acute ischemic stroke. The frequencies and percentages were calculated and chi-square was used to evaluate the significance. The p-value of <0.005 was considered significant.

RESULTS

The total number of patients was 94. Table 1 shows the demographics of the patients who presented to the hospital. The most common age group was >60 years and the majority of the patients were male (61.7%). The 51 (54.2%) patients have a BMI >25. 65 (69.1%) of the patients had diabetes.

Table 1: Demographics and basic information related to acute ischemic stroke patients

Variables (n=94)	Categories	Frequency (%)
Age (years)	20-40	10 (10.6)
	41-60	13 (13.8)
	>60	71 (75.5)
Sexual Category	Male	58 (61.7)
	Female	36 (38.3)

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BMI	>25	51 (54.2)
	<25	43 (45.7)
Diabetes	Yes	65 (69.1)
	No	29 (30.9)
Family history of Stroke	Yes	21 (22.3)
	No	73 (77.7)
Smoking	Yes	55 (58.5)
	No	39 (41.5)

Table 2 shows that 65 (69.1%) patients had hyperuricemia and 38 (40.4%) of the patients had the disease for 36-48 hours.

Table 2: Distribution of hyperuricemia, hypertension, and duration of disease

Variables (n=94)	Categories	Frequency (%)
Hyperuricemia Status	Yes	65 (69.1)
	No	29 (30.9)
Disease duration	12 - 24 Hours	19 (20.2)
	36-48 Hours	38 (40.4)
	More than 48 Hours	37 (39.4)
Hypertension status	Yes	50 (53.2)
	No	44 (46.8)

Table 3 shows the significant relationship between the patients with hyperuricemia with the male gender, hypertensive patients, and patients who smoke with a p-value of <0.001.

Table 3: The relation of hyperuricemia with gender, hypertension, and smoking

Variables	Categories	Hyperuricemia		p-value
		Yes (n=65)	No (n=29)	
Gender	Male	46 (70.8%)	12 (41.4%)	0.006
	Female	19 (29.2%)	17 (58.6%)	
Hypertension	Yes	46 (70.8%)	4 (13.8%)	<0.001
	No	19 (29.2%)	25 (86.2%)	
Smoking	Yes	41 (63%)	14 (48.3%)	<0.001
	No	24 (37%)	15 (51.7%)	

DISCUSSION

A cerebrovascular accident like stroke is described as the abrupt onset of neurological abnormalities caused by a specific vascular issue. It is a significant contributor to increased rates of mortality and long-term impairment as approximately 40% of survivors fail to get back their independence in self-care, and around 20-25% are not able to walk normally [1, 12]. A complex series of metabolic reactions induced by cerebral ischemia results in a mechanism that produces nitric oxide along with free oxygen radicals [3]. A quite significant aqueous antioxidant in humans is regarded to be serum uric acid which may offer protection to stroke victims [13]. However, it is still debatable if there has been an increase in the concentration of uric acid, it can lead to the risk of having an acute ischemic stroke due to a lack of Indian data. In light of this controversy and the dearth of information in India, our study has the objective to investigate uric acid levels in patients experiencing an episode of acute ischemic stroke and determine the possibility of a stroke recovery as a result of it. In the study, the authors included the cases as well as the controls if they had certain baseline traits, such as age, gender, measures of renal functioning, and lipid profile. Among the stroke cases, the average concentration of serum uric acid measured was 6.15±1.91 mg/dl, with 38% (30% and 50% male and female respectively) showing hyperuricemia. In the control group, 22% (14% male, 32% female) exhibited hyperuricemia and the concentration of the mean uric acid level was 5.1±1.4 mg/dl. Hyperuricemia in patients who visit hospitals frequently in Nepal was found to be 28.33% (30.06% male, 26.61% female) [14]. Similarly, an important study revealed that hyperuricemia was 24.4% frequent in the Bangkok population. [15, 16]. In China's economically developed regions, the adjusted incidence of hyperuricemia in adults was approximately 10% till 2010 [17]. These studies collectively indicate a significant acute stroke patients had a greater risk of hyperuricemia than the general public. Regarding non-modifiable risk factors, age is the most common factor associated with stroke development. In our study, 60% of patients fell between the ages of 60 and 79, with 17 males (56%) and 13 females (65%). Mullins *et al.*, researched patients more than 70 years old and discovered that in older persons, serum uric acid is associated with an increased risk of acute ischemic stroke, regardless of any underlying metabolic abnormalities [18]. Similarly, a German study revealed a higher proportion of male patients aged between 55 and 64 years and an overbalance of females in patients older than 84 years [19]. Our findings are consistent with these results, with the majority of patients in the age group of 60-79 years, with male predominance. In our analysis, the male gender reported a raised concentration of serum uric acid levels as compared to the females, although it was statistically insignificant. Smitha *et al.*, discovered that males had raised serum uric acid levels in comparison to women [20]. Another study also reported significant levels of uric acid levels increased in men [21]. In our study, the Glasgow Coma Scale (GCS) was utilized to determine the severity of the stroke. Mean serum uric acid levels were on the higher side in acute stroke patients with high GCS scores than those with mild and moderate GCS scores, with the difference being statistically significant. Ahn *et al.*, in 2013 found that Even after accounting for recognized risk factors such as raised blood pressure, diabetes mellitus (DM), age, cholesterol, and elevated uric acid levels were statistically related to a higher risk of both stroke incidence and death [22]. Additionally, a low serum uric acid concentration was marginally associated with an excellent short-term result [23, 24]. The massive limitation of this study was that it was

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carried out for a short period and in a single institute.

CONCLUSIONS

In conclusion, hyperuricemia appears to be prevalent in acute ischemic stroke patients, especially among the elderly population. Although its role as a risk factor remains controversial, evidence proposes a potential association. The significance of uric acid levels in blood in predicting stroke outcomes warrants further investigation, especially in the context of larger and more diverse patient populations. Understanding the complex interplay between hyperuricemia and acute ischemic stroke may open new avenues for stroke prevention and treatment strategies.

Authors Contribution

Conceptualization: MH[1]
Methodology: MH[1], MAH, AZ, NA
Formal analysis: MQ, FM
Writing-review and editing: MH[1], MTHT, NJ, NA, Mh[2]

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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