Original Article

Frequency of Hyperuricemia in Patients with Controlled and Uncontrolled Hypertension

Tasneem Jaweid[1*], Salma Razzaque[1], Ajeet Kumar[1], Marium Marufia Khan[1], Faiza Zaib[1]

ABSTRACT

OBJECTIVE: To compare the frequency of hyperuricemia between controlled and uncontrolled hypertensive patients.

METHODOLOGY: A cross-sectional study was done by the Department of Medicine at Sohail Trust Hospital Karachi, an associated hospital of Jinnah Medical & Dental College, from December 2024 to March 2025. The study employed non-probability consecutive sampling and involved a sample size of 150 participants. Informed consent was obtained from patients who met the inclusion criteria. Data were entered in the performa. Data analysis was performed using SPSS version 26.0. The Chi-square test was used to compare hyperuricemia between controlled and uncontrolled hypertensive patients at a 5% level of significance, and a P-value ≤ 0.05 was considered statistically significant.

RESULTS: Mean ± SD of age was 56.11±8.75 years. Mean ± SD of serum uric acid (SUA) was 7.44±2.27 mg/dl. 112 (74.7%) were male, while 38 (25.3%) were female patients. Controlled hypertension was present in 49 (32.7%), while uncontrolled hypertension was present in 101 (67.3%) patients. Hyperuricemia was found in 107 (71.3%) patients, among them 35 (23.3%) had controlled hypertension, while 72 (48.0%) had uncontrolled hypertension, and the p-value was determined as not statistically significant (P=0.986).

CONCLUSION: Hyperuricemia was highly prevalent in our population, although no significant association was observed between SUA levels and blood pressure control status. Larger multicenter studies with broader clinical parameters are recommended to explore this association further and determine its clinical significance.

KEYWORDS: Hyperuricemia, Hypertension, Controlled Hypertension, Uncontrolled Hypertension, Serum Uric Acid, Prevalence.

INTRODUCTION

Due to the increasing prevalence of hypertension, it has become an essential public health problem[1]. It is also considered one of the significant risk factors for cardiovascular disease, stroke and chronic kidney disease (CKD)[2]. Complications as a result of hypertension contribute to almost one-third of mortality related to cardiovascular diseases[3]. In 2019, 18.5 million cases of hypertension were estimated, with a mortality of 1.1 million. From 2000 to 2019, the prevalence of hypertension increased by 0.20% annually[4]. Hypertensive heart disease deaths are more in low- and middle-income countries, with a high proportion of premature deaths in Pakistan[5]. Uncontrolled hypertension is usually referred to as undiagnosed cases or lack of blood pressure (BP) control despite treatment or due to poor compliance with medications; it is still prevalent and seen in approximately 26% cases[6].

Understanding the risk factors of hypertension helps in adequate control and prevention of this disease. Various studies have shown that increased serum uric acid (SUA) levels may act as an independent risk factor for developing pre-hypertension, developing hypertension or resistant hypertension among people of various populations[7,8]. Animal studies have also shown that increased SUA levels caused hypertension among rats[9]. Mechanisms such as activation of the renin angiotensin system (RAS) and endothelial dysfunction related to nitric oxide synthase may represent a potential link between hypertension and hyperuricemia[9,10]. Hyperuricemia is also associated with hypertensive complications by causing target organ damage[11]. Moreover, it is also found that hyperuricemia is associated with increased risk of metabolic syndrome and dyslipidemia[12].

A study reported that the frequency of hyperuricemia to be 74.45% in hypertensive patients[13]. Another study has shown that in patients with uncontrolled hypertension, hyperuricemia was found in 18.6%, whereas in patients with controlled hypertension, hyperuricemia was found in 14.1%[14].

Our study aimed to evaluate the frequency of hyperuricemia among hypertensive patients and compare its prevalence between controlled and uncontrolled hypertension.

The rationale for studying the frequency of hyperuricemia in patients with controlled and uncontrolled hypertension is based on the well-

[1]*Department of Medicine, Jinnah Medical & Dental College, Karachi, Sindh-Pakistan*
Correspondence: *tasneem.jaweid@hotmail.com*
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established association between elevated SUA levels and hypertension. Evaluating its prevalence in relation to blood pressure control may provide insight into the potential role of uric acid in hypertension management. This understanding may help identify high-risk patients and guide clinical decision-making, particularly in individuals with poorly controlled hypertension at greater risk of cardiovascular complications.

METHODOLOGY

A cross-sectional study was conducted by the Department of Medicine at Sohail Trust Hospital, Karachi, an associated hospital of Jinnah Medical & Dental College, Karachi, from December 2024 to March 2025. It involved a sample size of 150 participants, which was estimated through the WHO calculator for sample size by taking the frequency of hyperuricemia (74.45%)[13] in hypertensive patients, margin of error (d)=7%, confidence level (C.I) =95%. Controlled hypertension is defined as known hypertensive patients on medication with systolic BP of <140 mmHg and diastolic BP of <90 mmHg, while uncontrolled hypertension is defined as systolic BP ≥140 mmHg and diastolic BP ≥90 mmHg despite medication. Hyperuricemia is defined as SUA of ≥7 mg/dL.

The study employed non-probability consecutive sampling. The study included male and female patients aged 30 to 80 years with either controlled or uncontrolled hypertension. Exclusion criteria included patients with secondary hypertension, those taking anti-tuberculosis drugs, immunosuppressants, chemotherapeutic agents, or aspirin, and those with a prior diagnosis of stroke or chronic renal failure. Patients unwilling to participate were also excluded.

Data collection was started after approval from the institution's ethical review committee. Informed consent was obtained from patients who met the inclusion criteria, ensuring confidentiality and explaining their right to withdraw at any time. Baseline data, including age, weight, height, body mass index (BMI), and blood pressure, were recorded. A stadiometer and a weighing scale, both without shoes, were used to assess height and weight, respectively. The BMI was calculated as weight (kg) divided by the square of the height (m) squared (kg/m2). A well-calibrated sphygmomanometer was used to measure blood pressure when the patient was comfortable, sitting or supine, with back support for at least 5 minutes. Blood samples were collected after 8 hours of fasting to measure SUA levels. The analysis was performed using the Cobas c 501 photometric method. Data were recorded on a predesigned pro forma, strictly following exclusion criteria to control for potential bias/confounders.

Data analysis was performed using SPSS version 26.0 (Armonk, NY: IBM Corp. Released 2012). Continuous variables were assessed for normality using the Shapiro–Wilk test. Descriptive statistics were presented as mean ± standard deviation (SD) for age, height, weight, body mass index (BMI), systolic blood pressure, diastolic blood pressure, and SUA. Categorical variables were expressed as frequencies and percentages for gender, controlled hypertension, uncontrolled hypertension, and presence or absence of hyperuricemia. The comparison of hyperuricemia between controlled and uncontrolled hypertensive patients was performed using the Chi-square test at the 5% level of significance. Stratification by age, gender, and BMI was conducted to assess potential effect modification. Post-stratification Chi-square tests were applied, and p-values ≤ 0.05 were considered statistically significant.

RESULTS

A total of 150 hypertensive patients were included in the study. There were 112 (74.7%) males and 38 (25.3%) females.

All continuous variables were normally distributed (Shapiro–Wilk test, p > 0.05). **Table I** presents the mean ± SD of continuous variables.

Controlled hypertension was observed in 49 (32.7%) patients, whereas uncontrolled hypertension was present in 101 (67.3%) patients. Hyperuricemia was found in 107 (71.3%) patients. Among them, hyperuricemia was present in 35 (23.3%) patients with controlled hypertension and 72 (48.0%) patients with uncontrolled hypertension. The difference in hyperuricemia frequency between controlled and uncontrolled hypertension was not statistically significant (P = 0.986), as shown in **Table II**.

Table I: Baseline descriptive characteristics of continuous variables in the study population (n = 150)

Variable	Mean±SD
Age Group	56.11±8.75
Weight	73.66±10.37
Height	168.67±8.45
Body Mass Index	25.93±3.55
Systolic Blood Pressure	158.35±28.31
Diastolic Blood Pressure	93.59±12.21
Serum Uric Acid	7.44±2.27

Table II: Comparison of hyperuricemia between controlled and uncontrolled hypertensive patients (n = 150)

Hypertension	Hyperuricemia		P-value
	Yes	No	
Controlled	35 (23.3%)	14(9.3%)	0.986
Uncontrolled	72(48.0%)	29(19.3%)	

Applied Chi-Square test

After stratification to evaluate the effect of confounders and effect modifiers on hyperuricemia, no statistically significant differences were observed across age groups (P = 0.585), gender (P = 0.646), and BMI categories (P = 0.322).

DISCUSSION

Hyperuricemia is a medical condition characterized by elevated SUA levels. Uric acid is the final product of purine metabolism. The SUA level depends on the purine intake, purine metabolism, and the renal and intestinal excretion of urate[15]. The uric acid-binding proteins increase the physiological solubility from 6 mg/dl to 7.0 mg/dl, thereby preventing uric acid crystallization.

The incidence of hypertension increases as age increases, which in turn results in more morbidity and mortality through several complications such as ischemic heart disease (IHD), heart failure, stroke, peripheral arterial disease and renal failure[16]. In hypertension, 5-10% of patients have an identifiable underlying cause, and it is termed as secondary hypertension, while 90-95% of patients have no identifiable cause and it is termed as essential hypertension[17]. In Pakistan, the incidence of hypertension was found to be 16.2% in the rural and 21.6% in the urban population[18].

Different studies have established the association between SUA and hypertension. One of the significant contributing factors for developing hypertension is hyperuricemia[19]. It has been recognized that hyperuricemia is also a risk factor for the progression of cardiovascular complications in hypertension[20]. Therefore, the control of hyperuricemia might be critical for hypertensive management. In the management of hypertension, especially with hyperuricemia, it might be crucial to select a drug which does not influence or reduce the concentration of uric acid[20].

Shah SS 2021[13] reported a mean age of 56.09±09.36 years. The mean SUA level was 6.96 ± 0.82 mg/dl, and the frequency of hyperuricemia among hypertensive patients was 74.45%. In another study, Raja S et al.[21] reported that the overall prevalence of hyperuricemia was 30.1%, and 67.3% hypertensive patients also had hyperuricemia. Bhosale A 2022[22] reported a mean age of 55.02 years and the prevalence of hyperuricemia in hypertensive patients as 27.7%. Rajadhyaksha A 2022[23] stated that 124 from a total of 316 patients with hyperuricemia were found to have hypertension, with SUA in patients with hypertension being 8.28 (±1.23) mg/dl.

In our study, 67.3% had uncontrolled hypertension. Farhadi F et al.[24] reported that the frequency of uncontrolled hypertension out of all the participants was 61.7%. Amare F 2020[25] noted that the incidence of uncontrolled hypertension is 48%.

In the current study, hyperuricemia was found in 35 (23.3%) and 72 (48.0%) patients with controlled and uncontrolled hypertension, having a non-significant P-value (P=0.986). There are only a few studies about the prevalence of hyperuricemia in uncontrolled hypertension. Liu C et al.[26] reported that hyperuricemia was associated with a high risk of sustained uncontrolled hypertension. The study of Cho J 2016[14] reported an average age of 56.1±10.5 years. It has been shown that in patients with uncontrolled hypertension, hyperuricemia was found in 18.6%, whereas in patients with controlled hypertension, hyperuricemia was found in 14.1%[14]. Borghi C et al.[27] stated that high SUA levels are associated with an increased risk of developing uncontrolled hypertension. Cicero AF et al.[28] concluded that raised SUA levels were also associated with resistance to antihypertensive treatment.

CONCLUSION

Although hyperuricemia was highly prevalent in our population, no statistically significant association was observed between SUA levels and blood pressure control status. Larger multicenter studies with broader clinical parameters are recommended to explore this association further and determine its clinical significance.

Ethical Permission: Jinnah Medical & Dental College, Karachi, Pakistan, ERC letter No. 00099/24.

Conflict of Interest: The author states no conflict of interest.

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Data Sharing Statement: The corresponding author can provide the data proving the findings of this study on request. Privacy or ethical restrictions bound us from sharing the data publicly.

AUTHOR CONTRIBUTION

Jaweid T: Concept, study design, data analysis.
Razzaq S: Editing and critical revision of manuscript.
Kumar A: Concept, supervision and critical revision of manuscript.
Khan MM: Writing of manuscript.
Zaib F: Data analysis.

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