

# PREVALENCE OF HYPERURICEMIA AND ITS ASSOCIATION WITH SOCIODEMOGRAPHY AMONG HYPERTENSIVE PATIENTS AT BIRAT MEDICAL COLLEGE TEACHING HOSPITAL

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## ABSTRACT

### Introduction

Hypertension is the most common cardiovascular diseases. In only 5-10 % of hypertensive patients, underlying cause can be identified (secondary hypertension). Serum uric acid is thought to play a pathogenic role in development of hypertension and is also a commonly associated condition in patients with hypertension. Management of hyperuricemia will ultimately help in reducing cardiovascular morbidity and mortality.

### Objectives

To determine the prevalence of hyperuricemia among hypertensive patients attending Birat Medical College Teaching Hospital and also to find association between hyperuricemia and socio-demographic variables.

### Methodology

This was a descriptive hospital based cross-sectional study conducted in 168 hypertensive patients at Birat Medical College Teaching Hospital, Nepal for a period of 6 months from 1<sup>st</sup> September 2020 to 28<sup>th</sup> February 2021. Socio-demographic variables were recorded and serum uric acid level was obtained based on the pre-structured questionnaires. Data were analyzed by Statistical Package for the Social Sciences version 20 (SPSS 20).

### Result

Prevalence of hyperuricemia was 42 (25%) among hypertensive patients with more prevalent in male 33 (30.8%) than female 9 (14.8%). Hyperuricemia was more prevalent in patients having higher BMI and patients aged more than 60 years i.e. 38 (34.5%) and 25 (41.7%) respectively. It was more prevalent among patients with hypertension for more than 15 years 10 (41.7%) and non-vegetarian 33 (25.8%). Hyperuricemia was significantly associated with those aged more than 60 years ( $p=0.002$ ) and BMI  $>25$  kg/m<sup>2</sup> ( $p=0.002$ ).

### Conclusion

Hyperuricemia was common associated condition among hypertensive patients. Hyperuricemia is mainly associated with male gender, non-vegetarian and patients with longer duration of hypertension. Similarly, it was strongly associated with older age and patients having higher BMI. Monitoring of serum uric acid and management of hyperuricemia might be helpful in management of hypertension and thus decreasing cardiovascular morbidity and mortality.

## KEY WORDS

BMI, hypertension, hyperuricemia.



## INTRODUCTION

Hypertension is one of the leading causes of the global burden of disease.<sup>1</sup> It is the most common form of cardiovascular disease. The prevalence of hypertension increases with aging, which in turn increases morbidity and mortality through various events such as coronary heart disease (CHD), congestive heart failure (CHF), ischemic and hemorrhagic stroke, renal failure, and peripheral arterial disease.<sup>2</sup> In only 5-10% of hypertensive patients, underlying cause can be identified (secondary hypertension), 90-95% of hypertensive patients are diagnosed as having essential hypertension.<sup>3</sup>

Uric acid largely exists as urate at neutral pH which is the end product of purine metabolism in humans. The serum urate level depends on dietary purines, the degradation of endogenous purines and the renal and intestinal excretion of urate.<sup>4</sup>

Different studies have demonstrated the association between serum uric acid level and hypertension. Hyperuricemia is an independent risk factor for developing hypertension.<sup>5</sup> Mechanism of hyperuricemia induced hypertension can be divided into 2 phases: an initial phase that is driven by uric acid per se and mediated by oxidative stress, inflammation, endothelial dysfunction, and activation of the renin-angiotensin-aldosterone system, and a later phase that is driven by arterial wall hypertrophy and renal microvascular changes and interstitial inflammation.<sup>6,7</sup>

Prevalence of hyperuricemia in hypertensive Nepalese patients was observed to be 28.8%.<sup>8</sup> Serum uric acid concentrations increases with age and further increases after menopause in women.<sup>9</sup> There are various factors such as metabolic syndrome, diabetes mellitus, chronic kidney disease, obesity, alcohol consumption, salt intake and fluid volume status etc. which can alter serum uric acid level.<sup>10</sup> Presence of hyperuricemia in patients with hypertension further increases cardiovascular morbidity and mortality.<sup>11</sup>

As hyperuricemia is an independent risk factor for the development of hypertension. Early detection of hyperuricemia will be valuable in management of hypertension. Thus, this study aimed to determine the prevalence of hyperuricemia and to assess its association with sociodemography among hypertensive Nepalese patients residing in this region.

## METHODOLOGY

This is a descriptive cross sectional study conducted in Department of Internal Medicine at Birat Medical College Teaching Hospital, Nepal for a period of 6 months from 1<sup>st</sup> September 2020 to 28<sup>th</sup> February 2021. A total of 168 patients with hypertension (Age >15 years) were enrolled based on convenient sampling technique. Prior to the study, ethical clearance was obtained from institutional review committee (IRC-PA-067/2077-78). Written consent was obtained from all hypertensive patients aged more than 15 years and willing to be enrolled in study. Patients with age less than 15 years, gout, chronic alcoholism, diabetes mellitus, chronic kidney disease, pregnancy, leukemia, lymphoma, carcinoma, anti-cancer therapy and who denied to give written consent were excluded from the study. All patients who met inclusion criteria were sent for serum uric acid assay in department of Biochemistry. All participants were asked relevant questions to note socio-demographic information based on pre-structured questionnaires. Patients

were categorized according age group in years (<30, 30-45, 45-60 and >60). Similarly body mass index (BMI) was calculated and all patients were categorized into BMI <25 and >25 kg/m<sup>2</sup>.

Hypertension was designated to patient who were already diagnosed by physician or according to blood pressure readings by European Society of Cardiology(ESC) and European Society of Hypertension definitions(ESH).<sup>12</sup> Patient who were already under antihypertensive drugs or with blood pressure more than 140/90 mmHg were enrolled in the study. Serum uric acid level greater than 6.0 mg/dL were considered as hyperuricemia.<sup>13</sup>

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 20.0 for Windows. Demographic variables were analyzed using descriptive statistics and association between sociodemography and hyperuricemia were analyzed using bivariate analysis and binary logistic regression.

## RESULTS

During the period of six months 168 hypertensive patients who met inclusion criteria were enrolled in this study. Out of which 107(63.7%) were male and 61(36.3%) were female. Mean age of participants was 54.95±12.84 years. Mean systolic and diastolic blood pressure was 146.01±9.49 mmHg and 89.52±7.08 mmHg respectively. Mean serum uric acid level was 5.39±1.32 mg/dl. Male participants had slight higher mean serum uric level than female i.e. 5.61±1.4 mg/dl and 5.01±1.07 mg/dl respectively. Most of them 77(45.8%) belong to aged 45-60 years. Majority of participants were non-vegetarian and had high BMI i.e. 128(76.2%) and 110(65.5%) respectively. (Table 1)

**Table 1: Sociodemographic characteristics of participants (n=168)**

Variable	Male	Female	Total
Frequency (n)	107(63.7%)	61(36.3%)	168 (100%)
Age Group (years)			
<30	3(2.8%)	2(3.3%)	5(3%)
30-45	16(15%)	10(16.4%)	26(15.5%)
45-60	47(43.9%)	30(49.2%)	77(45.8%)
>60	41(38.3%)	19(31.1%)	60(35.7%)
Religion			
Hindu	103(96.3%)	58(95.1%)	161(95.8%)
Muslim	2(1.9%)	2(3.3%)	4(2.4%)
Buddhist	2(1.9%)	1(1.6%)	3(1.8%)
Education			
No formal	35(32.7%)	42(68.9%)	77(45.8%)
Primary	12(11.2%)	8(13.1%)	20(11.9%)
Secondary	24(22.4%)	8(13.1%)	32(19.1%)
University	36(33.6%)	3(4.9%)	39(23.2%)
Diet			
Vegetarian	15(14%)	25(41%)	40(23.8%)
Non vegetarian	92(86%)	36(59%)	128(76.2%)
Smoking			
Current smoker	45(42.1%)	2(3.3%)	47(28%)
Ex-smoker	20(18.7%)	7(11.5%)	27(16%)
Non-smoker	42(39.3%)	52(85.2%)	94(56%)
BMI* (kg/m <sup>2</sup> )			
<25	19(17.8%)	39(63.9%)	58(34.5%)
>25	88(82.2%)	22(36.1%)	110(65.5%)

\*BMI: Body Mass Index (calculated as Weight in Kg /Height in meter<sup>2</sup>)

The prevalence of hyperuricemia among hypertensive patients was 42(25%). Similarly, prevalence of hyperuricemia



among male was 33(30.8%) and female was 9(14.8%). Hyperuricemia was most common among the patients of age group more than 60 years i.e. 25(41.7%). Hyperuricemia was more prevalent among non vegetarian and patients having higher BMI i.e. 33(25.8%) and 38(34.5%) respectively. (Table 2)

**Table 2:** Prevalence of hyperuricemia based on different category (n=42)

Variable	Number (n)	Percentage (%)
Overall	42	25
Male	33	30.8
Female	9	14.8
Age Group (years)		
<30	2	40
30-45	1	3.8
45-60	14	18.2
>60	25	41.7
BMI (kg/m <sup>2</sup> )		
<25	4	6.9
>25	38	34.5
Diet		
Vegetarian	9	22.5
Non vegetarian	33	25.8
Duration of Hypertension (years)		
0-5	10	15.9
5-10	11	22.9
10-15	11	33.3
>15	10	41.7

Hyperuricemia was more common among male hypertensive patients but it was not statistically significant ( $p=0.205$ ). This study showed significant association between hyperuricemia and older age group ( $p=0.002$ ), high BMI ( $p=0.002$ ) and smoking ( $p=0.018$ ). (Table 3)

**Table 3:** Univariate and bivariate analysis of hyperuricemia with sociodemographic variables and risk factors (n=42)

Variable	Hyperuricemia		Odds ratio (95% CI)	p value
	Number (n)	Percentage (%)		
<b>Gender</b>				
Male	33	78.6	1.926 (0.699-5.308)	0.205
Female	9	21.4		
<b>Age Group</b>				
<30	2	4.8		
30-45	1	2.4		
45-60	14	33.3		
>60	25	59.5	2.364 (1.372-4.071)	0.002
<b>Religion</b>				
Hindu	39	92.8	1.739 (0.689-4.40)	0.243
Muslim	1	2.4		
Buddhist	2	4.8		
<b>Education</b>				
No Formal	21	50	0.915 (0.688-1.217)	0.542
Primary	4	9.5		
Secondary	9	21.4		
University	8	19		
<b>BMI</b>				
<25	4	9.5		
>25	38	90.5	6.550 (1.952-21.976)	0.002
<b>Diet</b>				
Vegetarian	9	21.4		
Non-vegetarian	33	78.6	0.989 (0.352-2.774)	0.983
<b>Smoking</b>				
Current smoker	18	42.9	0.622 (0.419-0.922)	0.018
Ex-smoker	6	14.3		
Non-smoker	18	42.9		

## DISCUSSION

Hyperuricemia is one of the important associated conditions in patients with hypertension. Various studies had shown association between hyperuricemia and cardiovascular diseases, including coronary heart disease, stroke, congestive heart failure, arterial hypertension and atrial fibrillation.<sup>14</sup>

Majority of the participants in our study were male with male to female ratio of 1.7:1 which is similar to the study done by Feig et al.<sup>15</sup> In our study, majority of the patients were non vegetarian (76.2%) and about 2/3<sup>rd</sup> of the patients were having higher BMI (65.5%). Consumption of western style diets which include high calorie foods with increased carbohydrate, fat, red meat consumption, low fiber content and reduced physical activity have contributed to the increased prevalence of obesity and metabolic syndrome.<sup>16</sup> In this study, mean systolic and diastolic blood pressure of the participants were 146.01±9.49 mmHg and 89.52±7.08 mmHg which is similar to a study conducted in different region of Nepal.<sup>8</sup> In our study, we found mean uric acid level to be 5.39±1.32 mg/dl which is also similar to study conducted by Poudel et al.<sup>8</sup>

Prevalence of hyperuricemia among hypertensive patients in our study was 25% with 30.8% in male and 14.8% in female participants which is similar to study conducted in another region of Nepal.<sup>8</sup> This is slight higher than study conducted in Bangladeshi adults which showed prevalence of hyperuricemia to be 9.3% with 8.4% in male and 10.2% in female participants.<sup>17</sup> Hyperuricemia was more common in patients with higher age i.e. 41.7% in more than 60 years age group. This is in accordance to a report from a tertiary center of Nepal.<sup>9</sup> In contrast to this study done by Lin et al revealed to be highest prevalence among patients of younger age group.<sup>18</sup> This study showed increased prevalence of hyperuricemia in patient with longer duration of hypertension i.e. 41.7% in participants having hypertension for more than 15 years. This could be due to use of antihypertensive drugs especially diuretics. Hyperuricemia was more prevalent in participant having BMI more than 25 kg/m<sup>2</sup> (34.5%) which is similar to study conducted by Ali et al.<sup>17</sup> Increasing prevalence of hyperuricemia in obese patients could be due to its overproduction with a decrease in urinary urate excretion and clearance.<sup>19</sup>

We found clear association between certain sociodemographic variables and risk factors with hyperuricemia in hypertensive patients. For instance, our study revealed significant association between hyperuricemia and increasing age i.e. more than 60 years age group ( $p=0.002$ ). This is consistent with study done by Yadav et al which revealed prevalence of hyperuricemia to be 56.25% among age group >65 years.<sup>9</sup> Increasing prevalence of hyperuricemia with age might be due to impaired renal function, use of diuretics and higher prevalence of hypertension in elderly patients.<sup>9</sup> This study showed significant association between hyperuricemia and patients with BMI >25 kg/m<sup>2</sup> ( $p=0.002$ ). The underlying mechanism for this condition could be due to hyperinsulinaemia which causes marked reduction in uric acid excretion.<sup>20-21</sup>



## CONCLUSION

Prevalence of hyperuricemia among hypertensive patients was high. In present study, hyperuricemia was common in male gender, older age, obese patients. It was also common among non-vegetarian patients and patients with longer duration of hypertension. Hyperuricemia was strongly associated with older age and higher BMI.

## RECOMMENDATIONS

Prevalence of hyperuricemia was high among hypertensive patients. In clinical practices, measurement of serum uric acid level may help to identify associated condition in hypertensive patients. Proper management of hyperuricemia might help in controlling blood pressure and reducing cardiovascular morbidity and mortality.

## LIMITATIONS OF THE STUDY

This is a cross-sectional hospital based study having small sample size, representing hypertensive patients from the

eastern part of Nepal. It had not analyzed the effect of antihypertensive drugs in hypertensive patients. Confounding factors couldn't be controlled appropriately. The findings of this study, therefore, should be interpreted within context, and may not be generalized to the whole hypertensive patients.

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## CONFLICT OF INTEREST

None

## FINANCIAL DISCLOSURE

None

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