Prevalence of Hyperuricemia in Indian Population with Hypertension

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Received: 03 March 2023; Revised: 23 May 2023; Accepted: 23 May 2023

ABSTRACT

Background and objective: The prevalence rate of hyperuricemia (HU) is comparatively higher in Asian countries than in the Western regions. Patients with coexisting HU and hypertension (HTN) are at greater risk of uncontrolled HTN, metabolic syndrome, and complications. This study aims to determine the prevalence of HU in individuals with HTN from the major geographical regions across India.

Materials and methods: A cross-sectional, multicentric, observational study conducted in primary and secondary care centers from urban areas across different regions in India. Primary inclusion criteria were either a history of HTN or blood pressure systolic blood pressure (SBP) ≥140 and diastolic blood pressure (DBP) ≥ 90 mm Hg. A structured Google form was circulated among the participating healthcare practitioners from various participating centers to record the demographic, clinical, and biochemical parameters of patients visiting the respective centers. The data was consolidated and analyzed using Microsoft Excel. Screening for HU among individuals with HTN was based on two criteria—(1) self-reported diagnosed history of HU or (2) based on serum uric acid (SUA) levels >7 and > 6 mg/dL for men and women, respectively. The data were analyzed and represented using GraphPad Prism version 9.

Results: Among the study population from 12 participating centers across different regions in India, 1,528 individuals had HTN. The mean age of the study participants was 57.4 ± 10.5 years with a male-to-female ratio of 1:1. The total prevalence rate of HU among individuals with HTN is 22.5% (N = 345). Gender-wise analysis indicated that 51.5% (177) of the males and 48.5% (168) of the females had HU. Among the patients with HTN and HU, 75% were overweight with a body mass index (BMI) of ≥25 kg/m². The region-wise prevalence rate HU are North—17.4% (60), South—18% (62), Central—12.2% (42), East—29.6% (102), and West—22.9% (79).

Conclusion: India's overall HU prevalence rate (22.5%) was comparable to that in other Asian countries (10–30%). However, the prevalence of HU among HTN patients varies between different regions of India (12.2–29.6%). Results from the participating centers located in an urban setting indicated that the eastern region had the highest HU prevalence (29.6%) and the Central region had the lowest HU prevalence rate (12.2%). The varying prevalence rate can be attributed to the diversity in geographical factors, genetic background or (family history of HU), sociocultural habits, and metabolic perturbations. Understanding this prevalence rate diversity can help strengthen the HU prevention measures to improve quality of life.

INTRODUCTION

Hyperuricemia (HU) has long been recognized to be associated with the risk of developing hypertension (HTN). The prevalence of HU has steadily increased globally during the past 4 decades.1–4 The prevalence of HU has been increasing, especially in Asian countries, including Taiwan (10–52%), India (~25.8%), Japan (20–26%), and China (6–25%) compared to the Western countries, including United States of America (21–22%), Brazil (13%), and Italy (9–12%).1–4 The overall prevalence rate of HU in the Indian population with HTN is 25–28%.2 The major treatments include diet and lifestyle changes and xanthine oxidoreductase inhibitors. Other treatments include pharmacological interventions using angiotensin II/ nephrilysin inhibitors, atorvastatin, fenofibrate, losartan, metformin, sodium/glucose cotransporter 2 inhibitors, and sevelamer.2 Few studies2,6,7 have documented a higher prevalence of HU (24–37.33%) in patients with HTN as compared to healthy normotensive individuals (6–14%). Losartan, used to treat HTN has also shown effectiveness in the reduction of serum uric acid (SUA) levels in both animal and human studies.1,2 HU plays an important part in the development of HTN, often cooccurring and leading to increased health risks.8–10 HTN and HU are independent risk factors for cardiovascular diseases and their co-occurrence increases the risk exponentially. HU can increase the risk of developing HTN by almost 35%. The elevation of SUA is evident throughout all regions of the world. However, considerable regional variation exists in all countries, which can be attributed to anthropometric factors, environmental and genetic factors and geographical and socioeconomic factors.11 In India, a significant variation in the HU prevalence rate is expected across different regions owing to its socioeconomic, geographical, and cultural diversity.

A screening process for HU among the population with HTN is not currently being implemented. HU screening in patients with HTN conducted via SUA estimation can help alleviate further development of urate deposition and prevent further disease-related morbidity and mortality. However, there is a lack of epidemiological data on the prevalence of HU in subjects with type 2 diabetes. 

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diabetes mellitus (T2DM) and/or HTN in the Indian population. Therefore, considering India’s geographical and socioeconomic background, we have assessed the prevalence of HU among patients with HTN and its associated risk factors in the Indian population.

**Materials and Methods**

A cross-sectional, multicentric, and observational study from urban health centers across different regions in India. All the study participants were provided written informed consent before enrolment in the study. The study design is depicted in Figure 1.

Office blood pressure was measured twice within 5 minutes. The lower of the two readings was noted as the office blood pressure. A standard mercury-based blood pressure measuring instrument was used. SUA was measured using the photometry method. Reference values are males <7 mg/dL and females <6 mg/dL. Literacy rate and socioeconomic status were collected using the general questionnaire method.

**Inclusion and Exclusion Criteria**

A structured Google form was circulated among the study individuals from various participating centers to record the demographic, clinical, and biochemical parameters of patients visiting the respective centers. Data were filtered to include all individuals with HTN, defined as systolic blood pressure (SBP) ≥140 and diastolic blood pressure (DBP) ≥ 90 mm Hg. The data was consolidated and analyzed using Microsoft Excel. Screening for HU among individuals with HTN was based on two criteria—(1) self-reported the doctor’s diagnosis of HU, or (2) based on SUA levels >7 mg/dL for men or SUA >6 mg/dL for women. Pregnant women or lactating mothers and individuals <18 years of age are excluded from the study. Individuals not willing to provide written consent were also excluded from the study.

**Results**

Among the study population from 12 participating centers across different regions in India, 1,528 individuals had HTN. The mean age of the study participants was 57.4 ± 10.5 years with a male-to-female ratio of 1:1. The total prevalence rate of HU among individuals with HTN is 22.5% ($N = 345$) with 51.5% (177) of males and 48.5% (168) of females. The centers included, and the distribution of individuals is presented in Table 1.

The region-wise prevalence rates (Fig. 2) of HU are North—17.4% (60); South—18% (62); Central—12.2% (42); East—29.6% (102), and West—22.9% (79). The Eastern region had a higher HU prevalence (29.6%) and the Central region had a lower HU prevalence rate (12.2%).

Over 80% of the individuals suffering from HU were at least 50 years old and above, with a male-to-female ratio of 1:1. The demographic distribution is provided in Figure 3. Around >70% of the study population was 50 years old and above. Almost 90% of the study population was literate. Three-fourths of the study population had a body mass index (BMI) ≥25.

**Discussion**

We conducted a multicentric observational study involving urban health centers in a large population ($N = 1528$) to determine the co-occurrence of HU in patients with HTN. In this study, we assessed the prevalence of HU among the population with HTN in different regions (North, South, East, West, and Central) of India. The HTN among the population was defined by blood pressure level >140/90 mm Hg. The male-to-female ratio in our study was 1:1. We screened for HU in patients with HTN based on (1) previous history of HU; (2) SUA levels >7 mg/dL for men or SUA >6 mg/dL for women. Pregnant women or lactating mothers and individuals <18 years of age are excluded from the study. Individuals not willing to provide written consent were also excluded from the study.

Various studies have reported HU as an independent risk factor for T2DM and HTN. The co-occurrence of HTN and HU is commonly observed, increasing the risk of cardiovascular diseases. Elevated SUA levels...
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A 2011 study reported that for every 1mg/dL increase in SUA levels, the relative risk for developing HTN was 1.13. The risk was more pronounced among the younger population and females. Hence, screening of SUA levels at regular periods may serve as a suitable, rapid, reliable, affordable, and less invasive procedure to prevent the onset or progression of HTN.

Compared to the previous large-scale retrospective studies conducted in a population-based in India, our study’s prevalence of HU was lower. This could be caused by geographical location, genetic variation, population characteristics, and socioeconomic factors. We found a region-wise difference in the prevalence rate of HU (12.2–29.6%) in patients with HTN. Studies have reported HU prevalence of 46.5 and 33% in South India and Northeast India, respectively. This can be attributed to the difference in lifestyle, diet, geographical, and climate features of the specific region. Such differences in the prevalence of HU across various regions should be taken into account.

Table 1: Distribution of patients in region-wise participating centres

<table>
<thead>
<tr>
<th>S. no.</th>
<th>Name of the doctor</th>
<th>Region</th>
<th>Number of individuals with HTN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr Anuradha Kapoor</td>
<td>West</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Dr Kiran Shah</td>
<td>West</td>
<td>145</td>
</tr>
<tr>
<td>3</td>
<td>Dr Aashna Patil</td>
<td>West</td>
<td>295</td>
</tr>
<tr>
<td>4</td>
<td>Dr Bijay Patni</td>
<td>East</td>
<td>155</td>
</tr>
<tr>
<td>5</td>
<td>Dr Saumya Sengupta</td>
<td>East</td>
<td>77</td>
</tr>
<tr>
<td>6</td>
<td>Dr N K Singh</td>
<td>East</td>
<td>173</td>
</tr>
<tr>
<td>7</td>
<td>Dr J. Aravinda</td>
<td>South</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>Dr Mohsin Aslam</td>
<td>South</td>
<td>233</td>
</tr>
<tr>
<td>9</td>
<td>Dr Raka Sheohare</td>
<td>Central</td>
<td>99</td>
</tr>
<tr>
<td>10</td>
<td>Dr Ashish Saxena</td>
<td>North</td>
<td>101</td>
</tr>
<tr>
<td>11</td>
<td>Dr Basab Ghosh</td>
<td>North</td>
<td>50</td>
</tr>
<tr>
<td>12</td>
<td>Dr Dinesh Agarwal</td>
<td>North</td>
<td>100</td>
</tr>
</tbody>
</table>

Figs 3A to E: Demographics of individuals with HU. (A) Age; (B) Gender; (C) Literacy rate; (D) Socioeconomic status; (E) BMI
account, and a large-scale screening must be considered across the country.

The HU and HTN have common risk factors, such as age, gender, obesity, lipid profile, comorbidities, and hypertriglyceridemia. In a cross-sectional study conducted in India, the prevalence rate of HU in normotensive individuals was 12.1%, which was significantly lower than the prevalence rate (22.6%) we observed in our study. Therefore, it can be speculated that the prevalence of HU was higher in patients with HTN than in the general population, as HU is considered a positive risk factor for the development of HTN.

In accordance with previous studies, age was confirmed as an independent risk factor for HU. In our study, >80% of the individuals suffering from HU were 50 years or above. The increased incidence of HU in the elderly can be attributed to their reduced renal function status. In our study, the prevalence rate of HU in both sexes was similar, contradicting the findings of previous studies. In a study conducted in China, HU increased significantly with age in women, but it was not observed in men.

The current study is mainly concentrated on HU prevalence in urban areas. However, a previous study conducted in India reported that the ratio of individuals with HU in urban and rural areas was 1:1.129, indicating that the prevalence of HU is higher in urban areas. This can be because of the different lifestyles and diets among urban and rural regions.

**CONCLUSION**

The prevalence of HU in HTN patients varies between different regions of India (12.2–29.6%). The varying prevalence rate can be attributed to the diversity in geographical factors, genetic background or (family history of HU), sociocultural habits, and metabolic perturbations. However, the HU prevalence rate is comparable to that in Asian countries (10–30%). Therefore, understanding the diversity in the prevalence rate can help to strengthen the HU prevention measures to improve the quality of life.

**Limitations of the Study**

This study is an observational study with no control group. Uniform testing of patients from a single lab was not done. Number of patients enrolled in different centers was not uniform.

**REFERENCES**