



EVALUATION OF SERUM URIC ACID & ITS ASSOCIATION WITH ESSENTIAL HYPERTENSION IN NORMAL ADULTS.

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ABSTRACT

Introduction: The association between serum uric acid and incidence of primary hypertension has gained widespread attention in the recent years. However, it is conjectural whether elevated uric acid is a risk factor, a mediator or merely a marker for hypertension in humans. Some clinical trials have shown that uric acid lowering agents are able to reduce blood pressure in adolescents, signifying that it might be an independent risk factor for hypertension. There are limited studies evaluating the relationship between increased uric acid levels and hypertension in the general healthy population in India.

Objective: This study was conducted with an aim to evaluate the association between hypertension and raised uric acid level as an independent risk factor in adult population of North India.

Results: There were a total of 200 subjects in our study of which 120 were males and the remaining were females. The mean age was 43.3 years for the males and 41.2 years for the females. The prevalence of hyperuricemia in our study was 29.5% (n=59), and 57.62% (n=34) of persons with increased uric acid levels had an abnormal blood pressure reading. Group I had 9 (4.5%) subjects with prehypertension compared to 27 (13.5%) cases in the group II.

Conclusions: This study concludes that elevated serum uric acid levels are frequently associated with prehypertension and hypertension in general adult population, however there is a need of further studies especially in the Indian context to study the effect on severity and duration of hypertension with respect to uric acid levels.

KEYWORDS : Serum Uric Acid, Hypertension, SUA

INTRODUCTION

The prevalence of hypertension is increasing worldwide and is regarded as one of the modern pandemic, a silent killer. It is an important cause of cardiovascular diseases and premature death¹. The etio-pathogenesis of primary hypertension remains unclear and is believed to be comprised of a complex interplay of genetic, environmental, and behavioural factors². Elevated serum uric acid level had been reported to be linked with an increased risk of coronary heart disease and is frequently encountered with essential hypertension and type 2 diabetes, which are in turn related with coronary heart disease. Raised serum uric acid has been linked to pathogenesis and maintenance of essential hypertension³. It is not clearly understood whether increased serum uric acid levels increase the risk of hypertension independently of other recognized risk factors such as age, obesity, alcohol consumption, and physical activity³. Hyperuricemia is present in 25 – 50 % of individuals with untreated primary hypertension, about five times the incidence seen in normotensive persons. It reflects reduced renal blood flow apparently a reflection of nephrosclerosis in untreated hypertension⁴. It seems safe to say that hyperuricaemia in hypertension may be an initial indicator of hypertensive cardiorenal disease, which is commonly associated with a metabolic syndrome⁵. The association between serum uric acid and incidence of primary hypertension has gained widespread attention in the recent years as reported in various epidemiological studies⁶⁻¹¹. However, it is conjectural whether elevated uric acid is a risk factor, a mediator or merely a marker for hypertension in humans¹². Some clinical trials have shown that uric acid lowering agents are able to reduce blood pressure in adolescents, signifying that it might be an independent risk factor for hypertension¹³⁻¹⁴. There are limited studies evaluating the relationship between increased uric acid levels and hypertension in the general healthy population in North India. We conducted this study with an aim to evaluate the association between hypertension and raised uric acid level as an independent risk factor in adult population of North India.

MATERIALS AND METHODS

This study was conducted in a district level hospital of north India between December 2017 and December 2018. A total of 200 subjects of age more than eighteen years who were otherwise healthy (patient's attendants) were enrolled in this study. All study subjects were informed about the study aims

and written informed consent was obtained from them preceding enrolment. All subjects were clinically assessed, history was taken and anthropometric measurements done. The patients/ subjects with history of cardiac or renal disease, gout, pregnancy and drug intake like antihypertensives or uric acid lowering agents were excluded from the study. A fasting blood sample was taken to test the uric acid levels. The reference value of Hyperuricemia was taken as 7mg/dl. Hypertension was defined as a systolic blood pressure (SBP) of >140 mm Hg and Diastolic blood pressure (DBP) > 90mm Hg. Prehypertension was defined as SBP 120-139 and DBP of 80-89 mm Hg. The blood pressure was measured using a traditional mercury sphygmomanometer on left arm. Based on the uric acid levels the subjects were divided into two groups, Group I with serum uric acid levels of more than 7mg/dl and Group II with serum uric acid levels of less than 7mg/dl. The prevalence of prehypertension and hypertension was then measured in both the groups and compared. The statistical analysis was done using Microsoft Excel (Microsoft, USA).

RESULTS

There were a total of 200 subjects in our study of which 120 were males and the remaining were females. The mean age was 43.3 years for the males and 41.2 years for the females. Group I (SUA<7mg/dl) comprised of 141 subjects out of which 41.5% were males and remaining 29% were females. Whereas, Group II (SUA>7mg/dl) consisted of 59 subjects out of which 18.5% (n=37) were males and the remaining 11% were females. The prevalence of hyperuricemia in our study was 29.5% (n=59), and 57.62% (n=34) of persons with increased uric acid levels had an abnormal blood pressure reading. Group I had 9 (4.5%) subjects with prehypertension compared to 27 (13.5%) cases in the group II. The difference between the two is statistically significant. When we compared the number of hypertensive cases in both groups, the result was again statistically significant with group I having only 2 hypertensive subjects compared with 17 in group II having raised uric acid levels. The Serum Uric Acid levels in males ranged from 3.5 mg/dl to 9.6 mg/dl and in females ranged from 3.2 mg/dl to 8.9mg/dl. The comparative analysis among the two groups is presented in table 1. Our results indicate a positive correlation between hyperuricemia and hypertension in otherwise healthy adult population. However, there may be other confounding factors also influencing the results. The prevalence of prehypertension

and hypertension in individuals with increased uric acid levels achieved statistical significance with a p-value of < 0.05.

Table 1.

Parameter	Group I (SUA< 7mg/dl)	Group II (SUA> 7mg/dl)	Total
Males	83 (41.5%)	37 (18.5%)	120 (60%)
Females	58 (29%)	22 (11%)	80 (40%)
Prehypertension	9 (4.5%)	27 (13.5%)	36 (18%)
Hypertension	4 (2%)	17 (8.5%)	21(10.5%)
Total	141 (70.5%)	59 (29.5%)	

DISCUSSION

The present study yields a positive correlation between hyperuricemia and hypertension in otherwise healthy adult population of north India. Increased uric acid levels causes hypertension by stimulating oxidative stress and inflammatory mechanisms through endothelial dysfunction and stimulation of the renin-angiotensin system. SEPHAR III survey in Romania has reconfirmed the earlier findings of SEPHAR II, that, raised serum uric acid levels acts as an independent risk factor for hypertension development and negatively affect optimal control of blood pressure in treated patients¹⁵. There are many studies available in the literature that support this view, however there is no data available for the region where we conducted this study. A study by Kuwabara M, on association of serum uric acid and untreated hypertension in Japanese adults showed that hypertension Odds ratio was 1.20 for every 1 mg/dL increase in serum uric acid levels after adjustment of multiple confounding factors¹⁶. Available literature has also shown that elevated SUA levels were seen in hypertensive patients. Kinsey et al in his study reported a 46 % incidence of hyperuricemia in 400 hypertensives patients¹⁷. In another study, Kolbe et al found 26 patients out of 46 hypertensives to be having raised SUA levels, prevalence of 56%¹⁸. Breckenridge et al in his study found that excretion of uric acid and its clearance were lower in all hypertensive patients than in the controls. Furthermore, he reported a rising incidence of hyperuricemia as the diastolic BP increased, but there was no propensity for hyperuricemia to occur, only with patients with more severe hypertension¹⁹. It is possible that uric acid may be an earlier and sensitive marker of reduced renal blood flow than serum creatinine. It has been recently recommended that since uric acid may play a role in the formation of free radicals and oxidative stress, the increased risk of hypertension in subjects with raised serum uric acid levels might be associated with this enhanced production of free radicals. In our study the incidence of hyperuricemic patients having hypertension was 29.5 % in otherwise healthy adult population, which was statistically significant. Tykarski in his study reported that SUA level and the prevalence of hyperuricemia were meaningfully higher in hypertensive patients. Furthermore, he demonstrated that tubular secretion of uric acid was lower in hypertensive patients in comparison with normotensive subjects, and concluded that high prevalence of hyperuricemia in essential hypertension was caused by impaired renal excretion of uric acid²⁰. In a more recent study from Bangladesh, the authors evaluated the association of SUA with hypertension among 140 males and 115 females and analysed for SUA and lipid levels and reported that the prevalence of hypertension and prehypertension was significantly higher in male (15.4 and 47.6%, respectively) than in the female (5.6 and 33.4%, respectively) subjects (p < 0.01). Males had a higher mean level of SUA (310.7 ± 67.9 µmol/L) than in the females (255.3 ± 69.3 µmol/L) (p < 0.001). Hyperuricemia was prevalent 9.1% in males and 10.3% in females. An increasing trend for hypertension and prehypertension was found in both genders with increasing SUA levels in the quartiles (p < 0.01)²¹.

In this study we found that there is positive correlation in SUA levels between hypertensive patients and normotensive patients and there can be a directly proportional relation in the levels of SUA in relation to the duration and severity of hypertension. The main drawback of our study was small sample size and lack of randomization. There can be confounding factors affecting our results. Further large population-based research is needed to confirm these results and further study the correlation between the effect of duration & severity of hypertension and SUA levels, so as to make a generalized statement.

CONCLUSION

This study concludes that elevated serum uric acid levels are frequently associated with prehypertension and hypertension in general adult population, however there is a need of further studies especially in the Indian context to study the effect on severity and duration of hypertension with respect to uric acid levels. Since hyperuricemia is observed in untreated hypertension because of a decrease in the renal blood flow and early nephrosclerosis, unexplained increase in SUA levels in Essential Hypertension can be used as a simple biochemical marker in determining the severity and duration of hypertension. Furthermore, our results suggest that hyperuricemia screening can be used to identify patients at risk of developing hypertension

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