

Prevalence and Association of Hyperuricemia in Patients of Newly Diagnosed Essential Hypertension

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ABSTRACT

Introduction: Essential hypertension (80-95%) is more common than secondary hypertension (5-20%). The prevalence of essential hypertension increases with age. Serum uric acid is thought to play a pathogenic role in development of hypertension. The present study was done to determine the prevalence and association of hyperuricemia with newly diagnosed essential hypertension.

Material and methods: 50 newly diagnosed hypertensive subjects whose BP >140/90 mmHg and aged >40 years were included as case and 50 age and sex matched normotensive subjects as control to study the prevalence and association of hyperuricemia with hypertension. All those patients were excluded from the study with known hypertension, diabetes mellitus, renal impairment, malignancy, on chemotherapy, gout, history of drug intake causes hyperuricemia/hypouricemia, less than 40 years of age, cerebrovascular accident and myocardial infarction. In all the subjects detailed history was taken and thorough physical examination and appropriate laboratory investigations were done. Serum uric acid levels were measured in all the subjects.

Results: Mean serum uric acid was 5.80 ± 2.16 mg/dl in cases and 4.52 ± 1.27 mg/dl in controls ('p' value <0.05). A total of 13 (26%) subjects among cases and 3 (6%) subjects in control groups were hyperuricemic (Odds ratio 5.50; p <0.05). So the number of hyperuricemic patients and mean serum uric acid level were significantly higher in hypertensive cases, as compared to those of healthy normotensive controls.

Conclusion: Prevalence of hyperuricemia in patients with essential hypertension was significantly higher than normal population. Hyperuricemia is significantly associated with newly diagnosed essential hypertensives.

Keywords: Essential Hypertension, Hyperuricemia

INTRODUCTION

Hypertension is one of the leading causes of the global burden of disease. Hypertension doubles the risk of cardiovascular diseases, including coronary heart disease (CHD), congestive heart failure (CHF), ischemic and hemorrhagic stroke, renal failure, and peripheral arterial disease.¹ The prevalence of essential hypertension increases with age, and individuals with relatively high blood pressures at younger ages are at increased risk for the subsequent development of hypertension. Depending on methods of patient ascertainment, ~80–95% of hypertensive patients are diagnosed as having "essential" hypertension. In the remaining 5–20% of hypertensive patients, a specific underlying disorder causing the elevation of blood pressure can be identified (secondary hypertension).²

About 85% of uric acid is synthesised in our body and only 15% is by food intake. Hyperuricemia can result from increased urate production, decreased uric acid excretion by the kidneys, or a combination of the two mechanisms.³

Serum uric acid level can be a strong predictor of cardiovascular

disease when combined with elevated blood pressure (even mildly elevated). Endothelial dysfunction may be a possible pathway linking uric acid and cardiovascular disease.⁴ Uric acid is thought to play a pathogenic role in hypertension mediated by several mechanisms such as inflammation, vascular smooth muscle cell proliferation in renal microcirculation, endothelial dysfunction and activation of renin-angiotensin-aldosterone system.^{5,6}

The present study was done to determine the prevalence and association of hyperuricemia with newly diagnosed essential hypertension.

MATERIAL AND METHODS

This case-control study was conducted at Moti Lal Nehru Medical College, Allahabad during a period from May 2015 to August 2016. Ethical clearance was taken before the study from the local ethical clearance committee. An informed consent was taken from the study subjects.

Newly diagnosed essential hypertensive subjects, visited to medicine OPD or admitted in medicine department Swaroop Rani Nehru Hospital, Allahabad, whose BP >140/90 mmHg and aged >40 years were included as case and age and sex matched normotensive patients from OPD or admitted for some other illness were taken as control.

All those patients were excluded from the study with known hypertension, diabetes mellitus, renal impairment, malignancy, patient on chemotherapy, patient of gout, history of drug intake causing hyperuricaemia/ hypouricaemia, patient <40 years of age, cerebrovascular accident and myocardial infarction.

The patients more than 40 years of age whose BP were more than 140/90 mmHg first time in their life with proper method of blood pressure measurement on at least two occasions were considered as hypertensive. To label them as essential hypertensive secondary causes of hypertension were ruled out by proper and detailed history, thorough physical examination, appropriate laboratory investigations, ECG and fundus examination. Secondary causes of hyperuricemia were also ruled out. Investigations performed in all the subjects were serum uric acid level, liver function test, kidney function test, serum

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How to cite this article: Anurag Mishra, Poonam Gupta, Arvind Gupta, Sujit Kumar Verma, Ajeet Kumar Chaurasia, Dharamveer Sharma. Prevalence and association of hyperuricemia in patients of newly diagnosed essential hypertension. International Journal of Contemporary Medical Research 2017;4(2):404-406.

lipid profile, random blood sugar, complete blood count, gross blood picture, serum electrolyte, urine routine and microscopy, electrocardiogram, fundus examination, CRP. Serum urate concentration >6.8 mg/dL were considered hyperuricemia.

STATISTICAL ANALYSIS

'P' value calculated by using unpaired student 't' test. 'p' value <0.05 was considered as significant. Strength of the association was calculated by using Odds ratio (OR).

RESULTS

Out of 100 study subjects, 50 hypertensive subjects were taken as case and 50 non hypertensive subjects were taken as control. In the cases there were 29 males and 21 females. In the control there were 27 males and 23 females. In our study number of males were more than females. In the cases male: female ratio was 1.4 : 1 and in control male : female ratio was 1.2 : 1.

Mean serum uric acid level in case was 5.73 ± 2.17 mg/dl in males and 5.67 ± 2.16 mg/dl in females; this was statistically insignificant (p value >0.05). Mean serum uric acid level in control was 4.48 ± 1.31 mg/dl in males and 4.52 ± 1.29 mg/dl in females; this was also statistically insignificant (p value >0.05). Out of 50 cases the mean age was 51.9 ± 8.82 year and in control the mean age was 52.42 ± 8.14 year. Maximum study subjects were in between 40-50 years of age.

In the cases 13 subjects out of 50 were hyperuricemic. Prevalence of hyperuricemic in cases was 26%. In the age group of 40-50 year there were 27 cases; out of which 9 subjects were hyperuricemic. In the 50 cases mean serum uric acid level was 5.80 ± 2.16 mg/dl and in 50 controls mean serum uric acid was 4.52 ± 1.27 mg/dl. The difference in the mean serum uric concentration between cases and controls was statistically significant (p value <0.05).

Mean systolic BP in the cases was 159 ± 11.98 mmHg and in the controls was 116 ± 8.43 mmHg. Mean diastolic BP in the cases was 94 ± 6.42 mmHg and in the controls was 76 ± 8.53 mmHg. Difference in the mean systolic as well as diastolic blood pressure in the cases and controls were statistically significant (p value <0.05).

Serum uric acid was marginally associated with systolic blood pressure ($r = +0.367$) and diastolic blood pressure ($r = +0.302$). These associations were statistically significant (p value <0.05). Odds ratio between hypertension and hyperuricemia was 5.50; which was found to be statistically significant (p value <0.05).

DISCUSSION

Many studies reported a positive relationship between uric acid and essential hypertension whereas some demonstrated that uric acid did not relate significantly to essential hypertension. In various studies it was shown that serum uric acid is associated with myocardial infarction, cardiac failure, increased death in myocardial infarct patients and association with CVA and its recurrence.⁷⁻¹⁰ These finding made the uric acid a research area. So we also performed a study on the serum uric acid level in patients of newly diagnosed essential hypertension.

In our study we found the mean systolic BP in the cases was 159 ± 11.98 mmHg and in the controls was 116 ± 8.43 mmHg. Mean diastolic BP in the cases was 94 ± 6.42 mmHg and in the controls was 76 ± 8.53 mmHg. Difference in the mean systolic as well as diastolic blood pressure in the cases and controls were

Parameters	Hypertensive cases (n=50)	Normotensive controls (n=50)	'p' value
Age (yrs) (mean \pm SD)	51.9 \pm 8.82	52.42 \pm 8.14	0.76
S.Uric acid (mg/dl) (mean \pm SD)	5.80 \pm 2.16	4.52 \pm 1.27	0.0005
SBP (mmHg) (mean \pm SD)	159 \pm 11.98	116 \pm 8.43	0.0001
DBP(mmHg) (mean \pm SD)	94 \pm 6.42	76 \pm 8.53	0.0001
BMI (kg/m ²) (mean \pm SD)	23.98 \pm 2.08	22.72 \pm 1.30	0.0004
Hb (gm%) (mean \pm SD)	11.96 \pm 1.52	11.96 \pm 1.77	0.999
S. Creatinine (mg/dl) (mean \pm SD)	0.93 \pm 0.26	0.92 \pm 0.23	0.84
RBS (mg/dl) (mean \pm SD)	105.86 \pm 18.07	99.06 \pm 11.02	0.02
Males	29 (58%)	27 (54%)	NA
Females	21(42%)	23 (46%)	NA
Hyperuricemics	13 (26%)	3 (6%)	NA
Dyslipidemia	20 (40%)	13 (26%)	NA
Proteinuria	11 (22%)	5 (10%)	NA
CRP	5 (10%)	3 (6%)	NA

Table-1: Comparison of different parameters between hypertensives (cases) and normotensives (controls)

	R	'p' value
S. uric acid v/s Hypertension (SBP)	+0.367	<0.05
S. uric acid v/s Hypertension (DBP)	+0.302	<0.05

'r' \rightarrow Pearson's correlation coefficient.

Table-2: Association between hypertension and serum uric acid

	Hypertensive (n=50) [Cases]	Normotensive (n=50) [Controls]
Hyperuricemic	13	3
Non hyperuricemic	37	47

[Odds ratio= 5.50, 'p' value= 0.01, 95% CI]

Table-3: Strength of association between hypertension and serum uric acid with the help of Odds ratio

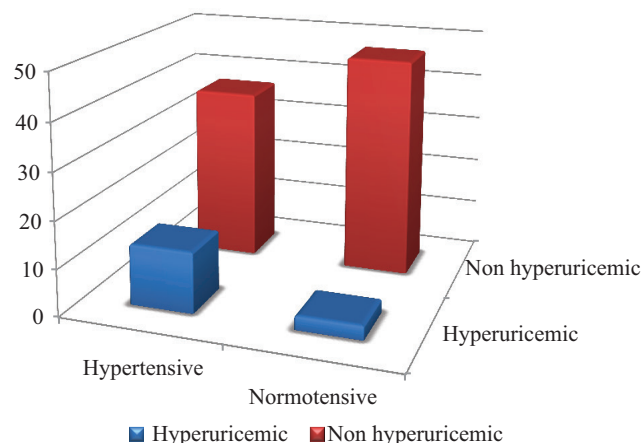


Figure-1: Hyperuricemics in study population

statistically significant (p value <0.05).

In the present study mean serum uric acid level was 5.80 ± 2.16 mg/dl in 50 cases and mean serum uric acid was 4.52 ± 1.27 mg/dl in 50 controls. The difference in the mean serum uric concentration between cases and controls was statistically significant (p value <0.05). In the present study 13 (26%) patients are hyperuricemic out of 50 cases and 3 (6%) patients are hyperuricemic out of 50 controls.

In this present study, observed difference of hyperuricaemia between cases and control well corresponds with Garrick et al.¹⁴, where they observed 31% of their study patients had hyperuricaemia with hypertension. The mean uric acid level in cases were close to that of Perlstein et al.¹³ and Strasak et al.¹², they found mean uric acid level 5.8 ± 0.9 mg/dl and 5.7 ± 1.2 mg/dl respectively. However, higher mean was observed by Feiget et al.¹¹, they found mean uric acid was 6.9 mg/dl in their study subjects.

In this study we found odds ratio between hypertension and hyperuricemia was 5.50; which was found to be statistically significant (p value <0.05). It suggests that there is 5.5 times higher risk of hypertension in hyperuricemics than that of non-hyperuricemics. Whereas odds ratio was also calculated by Kashem MA et al.¹⁵ in their study and odds ratio was found to be 3.15 with 'p' value <0.05 , which is almost consistent with present study.

John P. Forman et al.¹⁶ in their study found that plasma uric acid was not associated with incident hypertension in older men. This study gave negative results; whereas our study gave positive association between serum uric acid and hypertension. Large prospective studies are required to strengthen the results of this study.

Limitations of the study

This was a time bound study.

The sample size was small.

Obese subjects [body mass index more than 25 kg/m^2] were not excluded from this study.

Confounding factors couldn't be ruled out appropriately.

CONCLUSION

Prevalence of hyperuricemia was significantly higher in newly diagnosed subjects with essential hypertension than in age and sex matched normotensive subjects. Mean serum uric acid level was significantly increased in hypertensive subjects than age and sex matched normotensive controls. Serum uric acid was marginally associated with systolic blood pressure and diastolic blood pressure. This was statistically significant.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 21-01-2017; **Published online:** 03-03-2017