



ORIGINAL RESEARCH PAPER

General Medicine

EVALUATION OF SERUM URIC ACID IN ESSENTIAL HYPERTENSION

KEY WORDS: Serum Uric Acid; Hypertension; JNC VIII; Hyperuricemia

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ABSTRACT

BACK GROUND & OBJECTIVES: The association of raised serum uric acid levels with various cardiovascular risk factors has often led to the debate of whether raised serum uric acid levels could be an independent risk factor in essential hypertension. Hence we carried out a study to examine the possibility of hyperuricemia causing hypertension, to see if there is a relationship between the serum uric acid levels and severity & duration of hypertension.
METHODOLOGY: The study was carried out in Narayana medical college, Nellore, the study period was of 12 months from January 2018 to December 2018. A total of 400 patients were studied of which 200 were cases and 200 controls.
RESULTS: The study showed that serum uric acid levels were raised in patients with hypertension in comparison to normotensives.

INTRODUCTION

Uric acid, which serves no biochemical function other than being an end product of purine metabolism, was first discovered in 1776. Raised serum uric acid has been reported to be associated with an increased risk of coronary heart disease and is commonly encountered with essential hypertension, even untreated hypertension, and type 2 diabetes, which are in turn associated with coronary heart disease.

AIMS AND OBJECTIVES

1. To study the relationship between serum uric acid levels and hypertension.
2. To study the relation between severity of hypertension to the serum uric acid levels.
3. To study the relation between duration of hypertension and serum uric acid levels.

METHODS

In the following Hospital based study for the EVALUATION OF SERUM URIC ACID LEVELS IN ESSENTIAL HYPERTENSION 400 patients who attended the out-patient and in-patient at the department of Medicine in Narayana Medical College were evaluated for Serum Uric Acid levels of which 200 were cases and 200 were controls.

INCLUSION CRITERIA

Adult male and female patients > 18 years of age diagnosed as hypertensives according to JNC VIII classification for hypertension were included as cases.

EXCLUSION CRITERIA

Patients were excluded if they had any of the following -
 Diabetes Mellitus,
 Ischaemic Heart Disease,
 All cases of secondary hypertension,

Controls were patients without hypertension or any other condition known to cause hyperuricemia and were matched for age and sex.

Data collection and measurements:

The clinical examination consisted of a medical history, a physical examination, blood pressure measurement, anthropometric measurements, measurement of fasting serum uric acid levels and other parameters like Blood haemogram, Renal function tests (blood urea, serum creatinine), Electrocardiogram, Chest X-ray, Lipid profile, urine for protein and sugar.

Hypertension was defined according to the JNC VIII classification of hypertension as those with SBP of < 120 mm hg and DBP of < 80 mm hg as normal, those with SBP of 120-139 mm hg or DBP of 80 - 89 mm hg were labeled pre-hypertensive were not taken up for the study, those with SBP 140 - 159 mm hg or DBP of 90 - 99 mm hg were labeled as having Stage 1 hypertension, and those with SBP ≥ 160 or DBP ≥ 100 mm hg were labeled as Stage 2 hypertension.

Method of Uric Acid estimation

Principle

The principle for the determination of Serum Uric acid Levels was devised by Trivedi and Kabasakalian with a modified Trinder peroxidase method using TBHB.

Reference Values for SUA levels -

In Males : 3.4 - 7.0 mg/dl

In females : 2.4 - 6.0 mg /

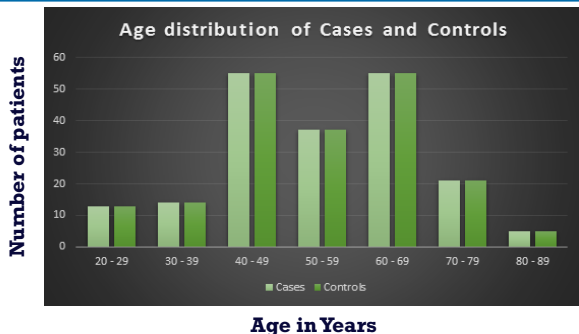
RESULTS

During the study period a total of 400 patients were studied of which 200 patients were cases that were categorized into Stage 1 or Stage 2 hypertension (Based on JNC VIII classification) and 200 were controls who were patients without hypertension or any other condition known to cause raised serum uric acid levels.

The total number of male cases was 145 and the total no of female cases 55. The age group ranged from 20 years to 90 years. Total number of male controls were 145 and the total no of female controls were 55. The age group ranged from 20 years to 90 years. The controls were adjusted with the cases for age and sex, shown in fig-1

Table 1 : Age distribution for cases and controls

AGE	CASES	CONTROLS
20 - 29	13	13
30 - 39	14	14
40 - 49	55	55
50 - 59	37	37
60 - 69	55	55
70 - 79	21	21
80 - 89	5	5

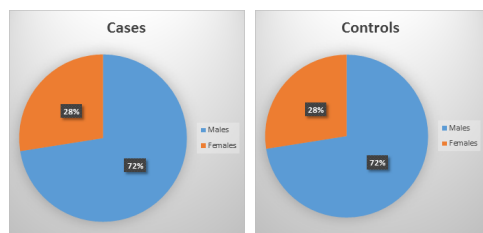


Total number of male patients were 145 and the total no female patients were 55 both in cases and controls table no. - 2

Table 2 Sex distribution of cases

Category	Cases	Controls
Males	145	55
Females	55	145

Fig 2 Sex Distribution of Cases and Controls



The Serum Uric Acid levels in male cases ranged from 3.8 mg/dl to 9.8 mg/dl and female cases ranged from 3.2 mg/dl to 9.5mg/dl.

The Serum Uric Acid levels in male controls ranged from 2.8- 9mg/dl and female controls ranged from 3- 8.4mg/dl.

The statistical analysis was performed using the SPSS 10.0 software package. The data was analyzed using the t-test (Independent sample t-test).

SUA and risk between cases and controls

The total number of cases were 200 (both male and female), the dataanalysis of the cases showed the mean SUA level to be 6.104 with a standard deviation of 1.576 (6.104 ± 1.576).The total number of controls of controls were 200 (both male and female), the data analyzed showed a mean SUA level of 5.685 with a standard deviation of 1.338 (5.685 ± 1.338), as shown in table no 3.

SUA Levels between Cases and Controls (Table - 3)

Category	Number	Mean ± SD
Cases	200	6.104 ± 1.576
Controls	200	5.685 ± 1.338

t = 2.866, p = .004

The t-value was found to be 2.866 and the p value = .004 which was significant. This showed that there was a significant rise in serum uric acid levels in patients with hypertension when compared to normotensives.

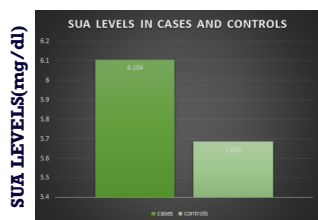


Figure- 3 - SUA levels in cases and controls

SUA and risk for severity of hypertension:

In the study done at our hospital the total number of patients assessed to have stage 1 hypertension was 48 patients (both male and female patients), the total number of patients having stage 2 hypertension was 152(both male and female patients).

The data analysis for SUA levels in the stages of hypertension showed a mean serum uric acid level in stage 1 hypertension of 5.0312 with a standard deviation of ± .77. The mean serum uric acid levels in stage 2 hypertensive patient were 6.4421 with a standard deviation of 1.615.

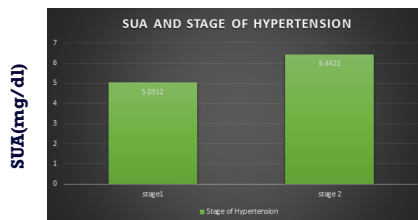
The t-value was 8.213 and a p-value of .000 which was significant. The data analysed showed that there was a significant rise in hypertension in patients who were having stage 2 hypertension i.e. those with a SBP ≥ 160 and a DBP ≥ 100 than those with stage 1 hypertension (SBP 140- 159 and DBP 90- 99) table – 4

SUA based on stage of Hypertension (JNCVIII)(Table - 4)

Stage of hypertension	Number	Mean ± SD
Stage 1	48	5.0312 ± .77
Stage 2	152	6.4421 ± 1.615

t = 8.213, p = .000

Figure 4 - SUA and stage of hypertension



SUA and risk based on the duration of hypertension -

The duration of hypertension was divided into 2 categories - those with hypertension for duration of hypertension < 5 years and those with a duration of hypertension ≥ 5 years. The total number of patients with hypertension for duration of < 5 years was 96, and the total number of patients with duration of hypertension ≥ 5 years was 104. The mean SUA level in patients with hypertension < 5 years was 5.163 with a standard deviation of 1.255. The mean SUA level in patients with hypertension ≥ 5 years was 6.972 with a standard deviation of 1.326.

The analyzed data showed a t-value of 9.891 and a p-value = .000 which showed that there is significant increase in SUA levels in patients with hypertension ≥ 5 years than those with a duration of < 5 years. Table - 5

SUA Levels Based on duration of Hypertension (Table - 5)

Duration of Hypertension	Number of Patients	Mean ± SD
< 5 years	96	5.163 ± 1.255
≥ 5 years	104	6.972 ± 1.326

t -value = 9.891 , p = .000

Figure 5 - SUA and duration of hypertension

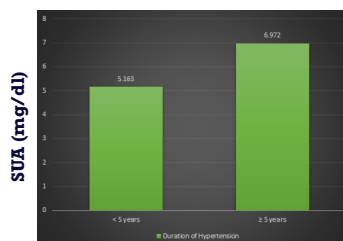
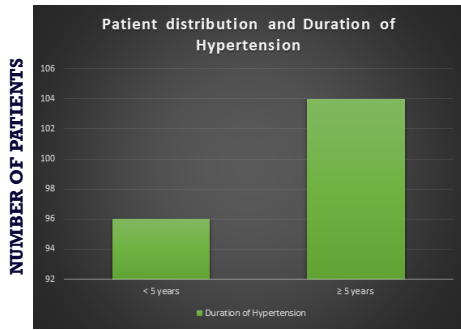


Figure 6 - Patient distribution and duration of hypertension



DISCUSSION

Elevated SUA levels have been associated with an increased risk for cardiovascular disease. The potential mechanisms by which SUA may directly affect cardiovascular risk include enhanced platelet aggregation and inflammatory activation of the endothelium¹.

In the present study the incidence of hyperuricemia in controls was 17% and the incidence of hyperuricemia in cases was 37%.

Various other studies have also shown that increased SUA levels were seen in hypertensive patients. Kinsey (1961) in his study with 400 hypertensive patients reported a 46 % incidence of hyperuricemia in hypertensives².

In a study by C. J. Bulpitt (1975), 48 % male hypertensives and 40 % female hypertensives had their SUA level in hyperuricemic range³.

Ramsay (1979) in his study of 73 men with untreated hypertension had 18 with raised serum uric acid levels (25%)⁴.

Messerli et al (1980) had an incidence of 72 % raised SUA in their study population of 39 established hypertensives⁵. Messerli and Frohlich et al hypothesized that the frequent presence of hyperuricemia in hypertensive patients reflects underlying renal dysfunction or reduced renal perfusion⁵

Several observations support the concept of free radical mediated inhibition of endothelium dependent vasodilation. The antioxidant drugs also show a blood pressure lowering effect in both diabetic and hypertensive patients⁵.

In a study by Tykarski (1991), he showed SUA concentration and the prevalence of hyperuricemia were significantly higher in hypertensive patients. They concluded that high prevalence of hyperuricemia in essential hypertension was caused by impaired renal excretion of uric acid⁶

In a group of 80 patient's attending the Hammer Smith hospital gout clinic only 2 were hypertensive. In a study of gouty patients of Northern India by Kumar et al they found that only one out of 30 patients had hypertension⁷.

In our study the incidence of Hyperuricemia in cases with stage 1 hypertension was 4.2 % and those with stage 2 hypertension was 4.11 %As to the possibility as to whether SUA levels was related to the severity and duration of hypertension, Breckenridge in his study showed an increasing incidence of hyperuricemia as the diastolic BP increased in his study, but there was no tendency for hyperuricemia to occur, only with patients with more severe hypertension.

CONCLUSION

With the results based on the study carried out we concluded

that there can be a direct relation between hyperuricemia and hypertension. Also the study showed that the SUA levels were significantly increased in patients with Stage 2 hypertension showing that the severity of hypertension also related to the SUA levels. The study also showed that the duration of hypertension had a significant impact on the SUA levels, those with a longer duration of hypertension had significantly raised SUA levels

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