



ORIGINAL RESEARCH PAPER

Physiology

RELATION BETWEEN SERUM URIC ACID LEVELS AND ESSENTIAL HYPERTENSION

KEY WORDS: Hypertension, Uric Acid, blood Pressure

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ABSTRACT

Hypertension is due to increased oxidative stress. As urate is natural anti-oxidant, increase in level of hypertension is a case or effect of raised uric acid level. **Aim:** Aim of the present study was to evaluate serum uric acid levels in cases of Essential Hypertension and comparison with normal controls in different grades of hypertension. **Material and Methods:** 100 subjects were taken out of which 50 were normal healthy control groups and 50 were of Essential Hypertension. Hypertensive subjects were further subdivided into 2 groups based on the level of Blood Pressure (JNC-7). **Results:** Mean serum Uric Acid levels is found to be 4.8 mg/dl in 50 controls and 5.7 mg/dl in 50 cases of Essential Hypertension, 5.5 mg/dl in stage 1 hypertension (BP=140-159mmHg) and 5.8759 in stage 2 hypertension (BP>160mmHg). **Conclusion:** It is seen that hypertension is related to rise in mean serum uric acid levels and this rise is directly related to severity of hypertension. Randomized control trials need to be done to see whether lowering serum uric acid level will ameliorate the level of blood pressure.

INTRODUCTION

Hypertension is defined as any one of the following: systolic blood pressure 140 mmHg, diastolic blood pressure ≥90 mmHg, taking antihypertensive medication¹² It is most common public health problem in developed countries and emerging as most important health problem in developing nations as well. The Global Burden of Disease Study estimate of age-standardized cardiovascular death rate of 272 per 100000 population in India is higher than the global average of 235 per 100000 population³

Essential hypertension is a form of hypertension that has no identifiable cause and accounts for about 90 percent case of Hypertension⁴ Essential hypertension may be due to increased oxidative stress. As urate is a natural antioxidant, the increase in level of hypertension is a case or effect of raised uric acid level⁵ Increased serum uric acid levels are linked to obesity, dyslipidemia and hypertension, insulin resistance or syndrome X, all of which are also associated with increased risk of cardiovascular disease.

MATERIAL AND METHODS

The study was approved by institutional ethics committee. A written consent of every subject was taken for performing examination and collecting blood samples.

The present study was carried out in two groups:

- (a) Control group: It consisted of 50 normal healthy individuals in age group of 20 to 50 years of different age and sex groups. Control groups were medical students, family members, interns, PG medical students, nurses, security guards and para medical staffs. The possibility of any of them having suffered in the past from any disease, known to produce its effect on serum uric acid was carefully ruled out by detail history and thorough clinical examination.
- (b) Study group: It consisted of 50 patients of Essential hypertension in same age groups.

Hypertensive subjects were further subdivided into 2 groups based on the levels of Blood Pressure (JNC-7):

Group I- Stage I of WHO and JNC-7: Systolic BP= 140-159mm Hg, Diastolic BP=90-99mm Hg

Group II- Stage II,III,IV of WHO or Stage II of JNC-7: Systolic BP>160 mm Hg, Diastolic BP>100 mm Hg

Exclusion from the study:

- (1) Persons with bleeding disorders like haemorrhoids, melena, peptic ulcer, menorrhagia, haematuria and

various malignancies

- (2) Persons having diseases that can alter serum uric acid values like Gouty Arthritis, Diabetes Mellitus, Leukemia-lymphoma

After thorough history and physical examination, Blood Pressure was measured in supine position as per recommendations of WHO Expert Committee on cardiovascular diseases by applying the arm cuff and aneroid manometer. Patients were considered hypertensive if at three consecutive occasions, blood pressure was found raised (Systolic BP>140 mm Hg, Diastolic BP>90 mm Hg).

Fasting blood samples were taken and serum uric acid was measured by colorimetric method in all cases and control groups and values analyzed statistically.

Principle Of Estimation:

- Enzyme Uricase converts uric acid to allantoin and Hydrogen Peroxide.
- It is uric acid but not allantoin which absorb light.
- Hydrogen peroxide formed further reacts with a phenolic compound and 4-aminoantipyrine to form a red coloured quinoneimine dye complex, whose concentration (intensity) is directly proportional to amount of uric acid present in the specimen and is read at 500nm.

Procedure:

- Pipetting is done into clean dry test tubes labelled as Blank, Standard and Test.
- All the three are mixed well and incubated at 37 degree centigrade for 5 minutes.
- Absorbance of the Standard and Test sample is measured against the blank within 30 minutes.

Calculations:

$$\frac{\text{Absorbance (T)}}{\text{Absorbance (S)}} \times 8$$

OBSERVATION

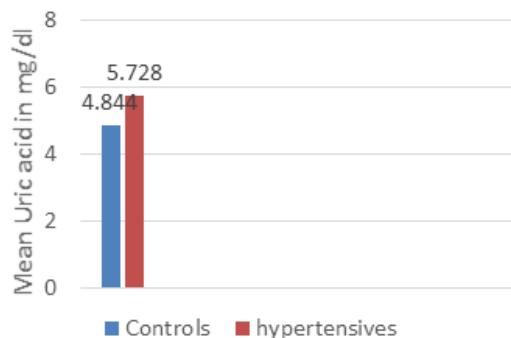
Serum Uric Acid was measured in all 50 cases of Essential Hypertension and 50 controls and results compared.

Table: I

Sl. No	Parameters	Normotensives	Stage I Hypertension	Stage II Hypertension
1	Mean Age	44.52	50.47	53.174
2	Serum uric acid range(mg/dl)	2.3-6.5	3.1-8.3	3.5-9.2

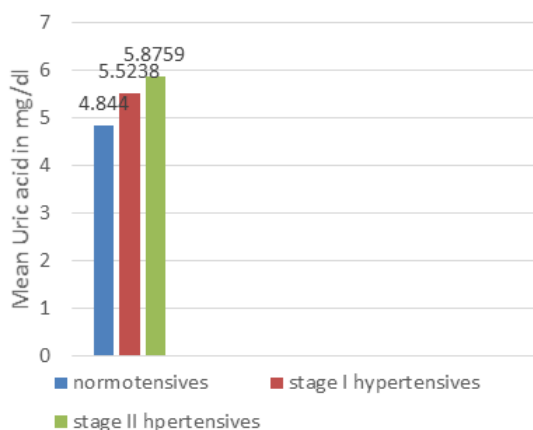
3	Mean serum uric acid levels(mg/dl)	4.4844	5.5238	5.8759
4	Standard deviation	0.95194	1.3957	1.5454
5	Standard error of mean	0.1346	0.3046	0.287

Fig I. Mean serum uric acid levels in controls & hypertensives



Mean serum Uric Acid levels is found to be 4.844mg/dl (range=2.3-6.5 mg/dl) in 50 controls and 5.728mg/dl (range=2.4-9.2 mg/dl) in 50 cases of Essential Hypertension (Figure: I). This value when compared statistically and “t” test done (“t”= 3.552) was found to be significant (p= 0.006, p<0.05).

Fig: II. Mean Serum Uric Acid levels in normotensives & in Stage I & Stage II hypertensives



Mean serum Uric Acid levels is found to be 4.844mg/dl (range=2.3-6.5) in 50 controls, 5.5 mg/dl (range=3.1-8.3mg/dl) in stage I hypertension, 5.9mg/dl (range=3.5-9.2mg/dl) in stage II hypertension (Figure:II)

RESULTS

Serum uric acid levels in stage I Hypertensives:

Out of 21 cases of stage I hypertension (BP=140-159mmHg), mean serum uric acid level is 5.5 mg/dl (range=3.1-8.3mg/dl) with 7cases (33.33%) were having serum uric acid above higher levels (>6mg/dl). This level when compared with normal controls were generally non significant (p>0.05)

Serum uric acid levels in stage II Hypertensives:

Out of 29 cases of stage II hypertension (BP>160mmHg), mean serum uric acid level is found to be 5.9mg/dl (range=3.5-9.2mg/dl) with 10cases (34.5%)out of 29 cases were having serum uric acid above higher levels (>6mg/dl). This level when compared with normal controls were highly

significant (p<0.0001).

DISCUSSION

The aim of present study was to evaluate the “serum uric acid level in case of essential hypertension” and comparison with normotensives (controls) in different grades of hypertension and result analyzed statistically. In all, 100 subjects were observed, out of which 50 were normal healthy control group and 50 were of essential hypertension. Hypertensive subjects were further divided into 2 groups on the level of Blood Pressure classification by JNC 7th report.

Out of 21 subjects of stage I hypertension, 7 (33 percent) were having serum uric acid above the higher level of normal range which is considered to be 6 mg/dl in Indian context. Messerli et al (1980) observed serum uric acid level above 6 mg/dl in about 80 percent cases.

Out of 29 subjects of stage II hypertension, 10 (34.5 percent) were having serum uric acid level above higher level of normal range (6 mg/dl). This observation is in agreement with Brekenridge(1966) and Kaplan(1980).

Serum uric acid level of hypertensive subjects when compared to control shows higher value in hypertensive subjects. The mean serum uric acid level is found to be 5.728 mg/dl with range of 2.4-9.2 mg/dl in hypertensives in comparison to 4.844 mg/dl with a range of 2.3-6.5 mg/dl in control subjects. This result being significant, shows a definite relation between hypertension and increased serum uric acid level. “Null Hypothesis” was nullified by the study conducted. The difference in mean value between two groups was 0.88 mg/dl which is definitely a significant value.

CONCLUSION

It is seen that hypertension is related to rise in mean serum uric acid levels and this rise is directly related to severity of hypertension. The rise in serum uric acid levels may be asymptomatic but may later develop into frank gout. Randomized control trials need to be done to see whether lowering serum uric acid level will ameliorate the level of blood pressure⁶

The clinical implication, if successful, would have profound effect on improving health in this group of hyperuricemic subjects.

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