



## A study to analyse the potentiality of Serum Uric Acid to use as a biomarker to detect Essential Hypertension Severity

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### Abstract

**Aim:** It has been seen that two third of patient who were having elevated blood pressure also unaware regarding their condition and as a result develop further complication. In a state like Bihar there was a need to correlate with a blood biomarkers which shed light on the underlying processes involved in the onset, development, and progression of essential hypertension. To analyse the potentiality of Serum uric acid to use as a biomarker to detect essential Hypertension Severity

**Material:** This was a single centre study. Total 120 patients were included in this trial where 60 subjects were with essential hypertension and rest 60 patients were without essential hypertension. This study was conducted at Diabetes centre in Bihar. Blood pressure was measured by a sphygmomanometer (Brand name Diamond) and pathological blood test was conducted at single NABL accredited pathology laboratory. Consent was taken from each participant. Current study was performed in accordance with the declaration of Helsinki.

**Result:** Subjects with essential hypertension also having high mean serum uric acid of  $6.8 \pm 0.2$  mg/dl where as it was normal i.e.  $4.2 \pm 0.2$  mg/dl with control subjects who were not having any grade of hypertension ( $p \leq 0.005$ ). It was observed that even duration of HTN is effect the level of serum uric acid. Subjects who were having HTN for more than 5 years were having serum uric acid of  $7.1 \pm 0.3$  mg/dl whereas subjects who were having HTN for less than 5 years were having serum uric acid of  $4.5 \pm 0.2$  mg/dl.

**Conclusion:** Serum uric acid can be used as a biomarker to detect essential hypertension severity and duration.

**Keywords:** Hypertension, uric acid, biomarker, severity and duration.

### Introduction

In south Asia, one of the most important risk factor for attributable burden of disease is high

blood pressure (BP) or essential Hypertension (HTN)<sup>[1]</sup>. Especially in India, HTN is one the major cause of cardio vascular events and death

related to cardiovascular disease<sup>[2, 3]</sup>. In India almost 57% death due to stroke and 24% death due to coronary heart disease (CHD) is directly responsible for immersing prevalence of HTN<sup>[4]</sup>. Even WHO (World Health Organization) has already considered HTN as one the main cause of deaths in worldwide<sup>[5]</sup>. The rates for HTN in percentage are projected to go up to 22.9 and 23.6 for Indian men and women, respectively by 2025<sup>[6]</sup>.

Biomarkers are objective, quantifiable characteristics of biological processes, which can be measured accurately and reproducibly<sup>[7]</sup>. They may or may not necessarily correlate with patient's clinical symptoms. Clinical endpoints, on the other hand, represent a study subject's health and wellbeing from the subject's perspective. Some specific biomarkers, however, have been well characterized and repeatedly shown to correctly predict relevant clinical outcomes across a variety of disease treatments and affected populations. Overt HTN is preceded by abnormalities in multiple biological pathways<sup>[8]</sup>. It is thus plausible that biomarkers involved in these multi-pathway abnormalities in normotensive or pre-hypertensive patients could foretell the increased risk of HTN. Studies have shown that pharmacological treatment of patients with prehypertension can delay the onset of HTN<sup>[9, 10]</sup>.

Even though the actual mechanism by which increasing uric acid effects cardiovascular system or end organ is still not clear, it was postulated that the effect of uric acid in endothelial dysfunction may responsible for its high impact on cardiovascular system.

The main purpose of this study is to analyse the potentiality of Serum Uric Acid to use as a biomarker to detect in Essential Hypertension Severity.

## Methods

Total 120 patients were included in this trial where 60 subjects were with essential hypertension and rest 60 patients were without essential hypertension. This study was conducted

at private clinic in Bihar. A written consent was collected from the subjects and the study was approved by Institutional ethical committee. Consent was taken from each participant. Current study was performed in accordance with the declaration of Helsinki.

Subjects whose age was in between 30 – 70 years without any cardiovascular events and visited to the out patients department were included in the study. Subjects were excluded who were having abnormally raised serum uric acid and renal failure.

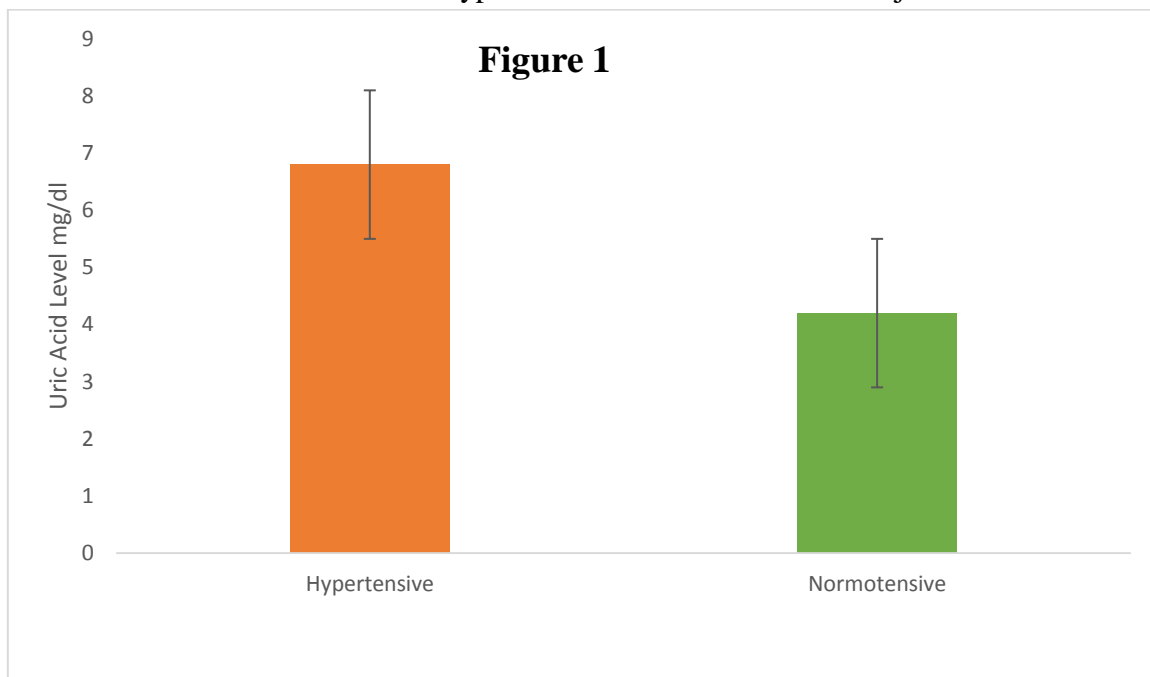
Hypertension was detected as per JNC VIII and measured by sphygmometer (Diamond BPMR112 Aneroid Blood Pressure Monitor, India). Serum uric acid was measured by kit method on ERBA XL-640 Fully Automated Analyser and conducted at single NABL accredited pathology laboratory. Data was arranged in MS Excel. Student's t test was used to compare difference in mean values between the two groups. Chi-square test was used for categorical variables. Paired t-test has been used for within group analysis. For every outcome variable, results are presented as mean  $\pm$  SD (Standard Deviation), p value  $<0.05$  was considered statistically significant. STATA 12.0 (STATA Corp, Houston, TX, USA) statistical software has been used for data analysis.

## Result

Demographical characteristics were almost similar in active and control group. Average age was  $61 \pm 6$  years and 71 (59%) patients were male.

Subjects with essential hypertension also having high mean serum uric acid of  $6.8 \pm 2$  mg/dl where as it was normal i.e.  $4.2 \pm 0.2$  mg/dl with control subjects who were not having any grade of hypertension ( $p \leq 0.005$ ). (Figure 1).

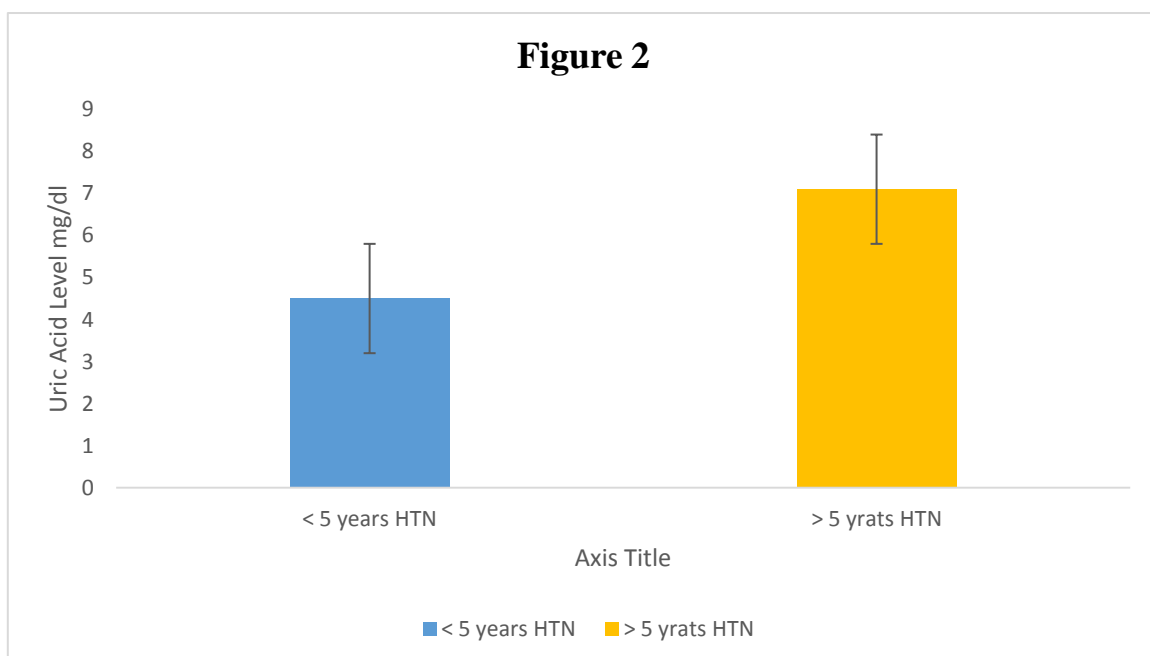
**Figure 1:** Mean Serum Uric acid Levels in hypertensive and normotensive subjects



It was observed that even duration of HTN is effect the level of serum uric acid. Subjects who were having HTN for more than 5 years were having serum uric acid of  $7.1 \pm 0.3$  mg/dl whereas

subjects who were having HTN for less than 5 years were having serum uric acid of  $4.5 \pm 0.2$  mg/dl. (Figure 2)

**Figure 2:** Mean Serum Uric acid Levels in <5 YRS &>5 YRS Duration after diagnosis of Hypertension (HTN)



**Discussion**

Increased risk of cardiovascular (CV) disease is associated with increased serum uric acid level. By increased enhanced platelet aggregation and

inflammatory activation of the endothelium increased serum uric acid may affect the cardiovascular system and structure<sup>[11]</sup>. Increased serum uric acid levels correlates with several risk factors

including renal dysfunction, hypertension, insulin resistance, hyper-homocystenemia and hyperlipidemia, it is debated whether serum uric acid is an independent cardiovascular risk factor [12-14]. Than higher amount of serum creatinine presence in blood aggravate free radical production which increased oxidative stress and there for led to inhibition of endothelium dependent vasodilation.

As extensively reviewed by Puig and Ruilope,<sup>[15]</sup> both uric acid and superoxide radicals are produced for the effect of xanthine oxidase in the late phase of purine metabolism. Superoxide radicals, which may cause tissue and vascular damage,<sup>[16]</sup> are increased in subjects with essential hypertension<sup>[17]</sup>.

Levels of other markers such as BNP, cardiac troponins, and markers of collagen turnover, are altered in the event of cardiac damage, which is independent of HTN<sup>[18,19]</sup>. However, measurement of all these markers has little value at present to justify their use in routine clinical practice over the use of the traditional screening methods, BP measurement, assessment of other risk factors, EKGs and ECHOs<sup>[20]</sup>.

In this observational study it has clearly demonstrated that high prevalence of serum uric acid is correlated to uncontrolled hypertension. Subjects with essential hypertension also having high mean serum uric acid of  $6.8 \pm 2$  mg/dl where as it was normal i.e.  $4.2 \pm 0.2$  mg/dl with control subjects who were not having any grade of hypertension ( $p \leq 0.005$ ). It was observed that even duration of HTN is effect the level of serum uric acid. Subjects who were having HTN for more than 5 years were having serum uric acid of  $7.1 \pm 0.3$  mg/dl whereas subjects who were having HTN for less than 5 years were having serum uric acid of  $4.5 \pm 0.2$  mg/dl.

Serum uric acid levels with duration and severity of blood pressure there was a correlation. Breckenridge in his study showed an increasing incidence of hyperuricemia as the diastolic BP was shown increased in his study, but there was

no tendency for hyperuricemia to occur, only with patients with more severe hypertension<sup>[21]</sup>.

### Conclusion

Essential hypertension is a major risk factor for peripheral vascular disease, stroke, renal disease, CAD and heart failure. Hypertension is still diagnosed by conventional BP readings. Correlation between high serum uric acid and increased blood pressure has been established by this trial. The study has concluded that Serum uric acid can be used as a biomarker to detect essential hypertension severity and duration.

**Conflicts of Interest:** The authors have no conflicts of interest to declare.

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