

## ORIGINAL RESEARCH

**Study of correlation of serum uric acid with preclinical target organ dysfunction in essential hypertension patients****Dr. V.Chandra Sekhar**

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**Abstract**

**Background:** Hypertension (HTN) is the main source of preventable passing and incapacity around the world, just as a significant worldwide danger factor for cardiovascular illness. It is assessed that 30-45% of everyone makes them result, in an expanded weight of coronary illness, vasculopathy, nephropathy, and cerebrovascular harm, which can all be destructive.[1]. Essential hypertension (EH) affects approximately 90% of people with HTN who have increased blood pressure for no apparent cause.

**Aim of the study:** The review's motivation is to find assuming there is a connection between blood uric acid and preclinical objective organ disintegration in people with fundamental hypertension.

**Materials & Methods:** A prospective cross-sectional study on 60 patients was undertaken at Maheshwara Medical College in Patancheru, Telangana, from October 2020 to March 2021, in the department of General Medicine.

**Results:** The majority of instances occurred in the 40-50 year age group, accounting for 48.3 % (29/60), followed by 30 % (18/60) in the 29-39 year age group, with a mean age of 41.77 years. Males accounted for 63.3 % (38/60) of the total, while females accounted for 36.6 % (22/60). The blood uric acid level was elevated in 85 percent of the individuals (51/60). Serum uric acid levels were found to be normal in 15% of the people (09/60).

**Conclusion:** As indicated by the review, hyperuricemia is associated with LVH, which is a typical objective organ harm and expanded danger of cardiovascular occasions in hypertension. Subsequently, individuals with hypertension ought to have their Uric acid levels assessed consistently.

**Keywords:** Hypertension (HTN), Serum uric acid, cardiovascular disease.

**Introduction**

Hypertension (HTN) is the main source of preventable demise and inability around the world, just as a significant worldwide danger factor for cardiovascular sickness.[1] It is assessed that 30-45% of everybody makes them result, in an expanded weight of coronary illness, vasculopathy, nephropathy, and cerebrovascular harm, which can all be dangerous.[1]. Essential hypertension (EH) affects approximately 90% of people with HTN who have increased blood pressure for no apparent cause [2]. An idiopathic persistent increase of systemic BP is characterized as EH [2]. This is generally an exclusionary diagnosis given after all other causes of HTN have been ruled out (secondary hypertension). A portion of the reasons for optional HTN incorporate white coat HTN, aspiratory HTN, pregnancy-related HTN, Cushing disorder, renovascular reasons, renal parenchymal illness,

essential hyperaldosteronism, and pheochromocytoma[3]. A higher blood uric acid level has been identified with an expanded danger of creating hypertension [4], with 25 to half of hypertensive people being hyperuricemic. Hyperuricemia additionally expands the danger of cardiovascular infection, particularly in ladies[4,5]. Late cross-sectional, partner, and interventional studies have shown hyperuricemia as a free danger factor for hypertension[6]. In women, the risk of sickness increases even at lower blood uric acid levels than in men, demanding increased attention. Hyperuricemia is every now and again related with metabolic condition, hypertension, diabetes, dyslipidemia, persistent renal sickness, and corpulence, and blood uric acid levels shift significantly relying upon diet, way of life, sex, and late diuretic use.[7].

### **Aim of the study**

The review's motivation is to find in case there is a connection between blood uric acid and preclinical objective organ crumbling in people with fundamental hypertension.

### **Materials and methods**

The Institutional Ethics Committee gave their approval to the project. All of the patients included in the research gave their written informed consent. A prospective cross-sectional research was conducted on 60 patients at Maheshwara Medical College in Patancheru, Telangana, over a period of seven months, from October 2020 to March 2021.

### **Sample size**

60 cases

Calculated using the formula

$$N = Z^2 \times P(1-P)/d^2$$

Where N is the sample size;

Z is the statistic corresponding to level of Confidence;

P is the expected prevalence and

d, the precision [8].

### **Inclusion criteria**

- Patients who are interested in taking part in the research
- Age between 18 to 61 years.
- Newly diagnosed essential hypertension patients.

### **Exclusion criteria**

- Patients who refuse to take part in the research
- Patients above the age of 61.
- Hypertension for more than 6 months.
- Diabetes mellitus.
- Cardiac failure.
- Chronic kidney disease.
- Patients who are using diuretics, ACE inhibitors, or ARBs.
- Secondary hypertension.

In the current review, 60 hypertension patients with pulse more than 140/90 mm Hg were enlisted. Cases were selected randomly. A clinical proforma (questionnaire) was created that covered the following information: current history, past history, personal history (including smoking and alcohol history), and family history of cardiovascular and renal disorders. A general and systemic investigation was carried out. Hypertension was characterized as having

a systolic pulse of 140 mm Hg or a diastolic circulatory strain of 90 mm Hg or being on antihypertensive medicine. A blood uric acid level more than 7.0 mg/dL in men and under 6.0 mg/dL in ladies is considered hyperuricemia[9]. Target organ hurt was characterized by the presence of raised blood uric acid levels, microalbuminuria (urinary albumin discharge: 20200 mg/L), or echocardiographic proof of LV hypertrophy (LVH).

As a component of the circulatory strain observing, all patients' systolic and diastolic blood pressures were estimated. Hypertension was characterized as having a systolic pulse of 140 mmHg or higher and a diastolic circulatory strain of 90 mmHg or higher.

### **Laboratory investigations**

Routine investigations, such as CBP and CUE, were conducted. All of the investigations were completed and examined for comorbidities. The lipid profile remembers uric acid levels for the blood, fasting glucose levels, complete cholesterol, fatty oils, high-thickness lipoprotein, and low thickness lipoprotein. RFTs incorporate blood urea, serum creatinine, assessed glomerular filtration rate (eGFR), LFT, and serum electrolytes.

### **Serum uric acid levels (SUA)**

Serum The uricase enzymatic colorimetric methodology was utilized on an autoanalyzer to test uric acid levels, with the typical reach for grown-up men being 3.6 7mg/dl and 2.3 6.1mg/dl for grown-up females.

### **Spot urine microalbumin test (Microalbuminuria)**

All patients were approached to give a solitary 24-hour pee test to evaluate the UAE (Urine Albumin discharge). A spot pee microalbumin test was performed utilizing the radio immunoassay pack. Microalbuminuria (MA) was characterized as UAE readings of 20 to 200 mg/24 h (78), with UAE esteems under 20 mg/24 h thought about ordinary.

The albumin creatinine proportion was determined (lab standard Adults 30mcg/mg creatinine).

### **Additional investigations**

#### **Echocardiogram**

Patients were recumbent in the left parallel situation very still, and echocardiograms were acquired using standard parasternal and apical points of view. ECG with 12 leads for left ventricular hypertrophy.

### **Spot urine microalbumin test: (Microalbuminuria)**

On all patients, a spot pee microalbumin test was performed utilizing the radio immunoassay unit. The albumin creatinine proportion was determined (lab standard Adults 30mcg/mg creatinine).

### **2D Echocardiogram**

Done for LV mass using the formula

$$\text{LV mass (gms)} = 0.80 \times 1.04[(\text{VSTd} + \text{LVIDd} + \text{PWTd})^3 - (\text{LVIDd})^3] + 0.6$$

VSTd = Ventricular septal thickness at end diastole

LVIDd = LV internal dimension at end diastole

PWTd = LV posterior wall thickness at end diastole.

### **Fundoscopy**

Done for hypertensive retinopathy using Keith and Wegner grading [10].

Grade I: Mild generalised arteriolar attenuation, with arteriolar light reflex widening and vein hiding

Grade II: Mild generalised arteriolar attenuation, with arteriolar light reflex widening and vein hiding

Grade III: Grade II changes incorporate copper wiring of arterioles, banking of veins distal to arteriovenous intersections (Bonnet sign), tightening of veins on one or the other side of the intersections (Gunn sign), and right point redirection of veins (Salus' sign).

Grade IV: All Grade III alterations, as well as arteriole silver-wiring and papilloedema.

### Statistical test

The data will be entered into a Microsoft Excel spreadsheet and analysed with the statistical tool SPSS 20.0. Tables and charts will be used to display data.

For qualitative data analysis: The Chi Square test was performed.

Quantitative data analysis: The 't-test' and ANOVA tests will be utilized to assess importance in the event that a p worth of under 0.05 is thought of as huge.

### Results

We separated the members into three age gatherings to examine the connection between serum uric acid and pulse at various ages: 18-28, 29-39 years, 40-50 years, and 51-61 years. The age appropriation in the momentum research went from 18 to 61 years, with a mean period of 41.77 years. The majority of instances were reported among 40-50 year olds, i.e., 48.3% (29/60), followed by 30% (18/60) among 29-39 year olds, and 11.6% (07/60) among 18-28 year olds, with the least reported among 51-60 year olds, i.e., 10% (06/60).

Males were predominant ie, 63.3 % (38/60) compared to females ie, 36.6 % (22/60). In the present study 88.3 % (53/60) of cases show family history of vascular events. 11.6% (07/60) were with no family history of vascular events. 35 % (21/60) have shows history of both smoking & alcohol. 20 % (12/60) cases have history of smoking. 21.6 % (13/60) cases have history of alcohol. 23.3 % (14/60) cases with absence of history of both smoking & alcohol.

In the current review, 61.6% (37/60) of the members had pulse that was either systolic (140-160 mm Hg) or diastolic (90-100 mm Hg). 23.3% (14/60) had a systolic pulse more noteworthy than 160 mm Hg or a diastolic circulatory strain more prominent than 100 mm Hg. 15% (09/60) had systolic pulse of 140 and diastolic circulatory strain of 90 mm hg.

15 subjects showed obesity and overweight. Among 15 cases, 66.6 % (10/15) showed BMI > 30 – obesity. 33.3 % (05/15) showed BMI 25 – 30- overweight.

Serum uric acid levels were elevated in 85 percent (51/60) of the patients. 15% (09/60) had normal serum uric acid levels.

Microalbuminuria was present in 81.6% (41/60). 18.3% (11/60) showed no urine albumin excretion. 83.3 % (50/60) cases show ECG changes of left ventricular hypertrophy (>5). 16.6 % (10/60) cases show cases show ECG changes of left ventricular hypertrophy (<5). 80 % (48/60) showed Carotid IMT > 1 mm (abnormal). 20 % (12/60) carotid IMT < 1 mm (normal). 83.3% (50/60) showed LV mass index >51. 16.6 % (10/60) showed LV mass index <51.

70 % (42/60) showed Grade II retinal changes. 16.6% (10/60) showed Grade III retinal changes. 13.3 % (08/60) showed Grade I retinal changes.

**Correlation of uric acid levels with various parameters and statistical significance****Table 1: Correlation of Age with Uric Acid and Indices of Target Organ Damage**

	Uric acid	Microalbuminuria	LV mass index	Carotid IM
Age	0.149 P- 0.257	0.085 P- 0.517	0.156 p-0.235	0.216 p- 0.097

There is no measurably huge connection between age, uric acid, or different signs of target organ harm.

**Table 2: Correlation of Sex and Uric Acid**

Characteristic	Sex	No. of cases	Mean uric acid levels	SD	t-test
Uric acid	Male	38	8.03	1.442	1.381 p- 0.172
	Female	22	7.45	1.711	

There is no measurably critical connection among SEX and uric acid.(p = 0.172).

**Table 3: Correlation of Menopausal State With Uric Acid**

Characteristic	No. of cases	Mean uric acid levels	SD	t-test
Post menopausal	03	8.33	0.577	0.955 (p-0.351)
Pre menopausal	19	7.32	1.797	

There was no measurably huge distinction in mean uric acid levels between pre-menopausal and post-menopausal female patients.(p = 0.351).

**Table 4: Correlation of Family History of Vascular Events with Uric Acid Levels**

Characteristic	Family history of vascular events	No. of cases	Mean uric acid levels	SD	t-test
Uric acid	Yes	53	7.79	1.536	-0.329 p-0.743
	No	07	8.0	1.826	

The distinction in mean uric acid levels between patients with and without a positive family background of vascular occasions (p =0.743) was not measurably huge.

**Table 5: Correlation of Habituation to Smoking / Alcohol to Uric Acid Levels**

Characteristic	Smoking/Alcohol	No. of cases	Mean uric acid levels	SD	t-test
Uric acid	Yes	36	7.87	1.515	0.474 p-0.637
	No	14	7.64	1.737	

The impacts of liquor or smoking fixation on mean uric acid levels were irrelevant. (p = 0.637).

**Table 6: Correlation of Average Blood Pressure with Uric Acid Levels**

S.No.	Parameter	No. of cases	Mean uric acid levels	SD	t-test
1	Systolic < 140 and Diastolic < 90 mm of hg	09	5	1.500	p- 0.000
2	Systolic 140 – 160 or Diastolic 90 – 100 mm of hg	36	8.28	1.003	
3	Systolic > 160 or Diastolic > 100 mm of hg	15	8.40	0.632	

The distinction in mean uric acid levels between Group 1 and Group 2 blood pressures, just as between Group 1 and Group 3 blood pressures, is measurably critical. (p-0.000).

There is no measurably huge distinction in blood pressures in Groups 2 and 3. (p-0.919).

**Table 7: Correlation of Blood Pressure Control with Target Organ Damage**

Characteristic	Target organ damage	Correlation coefficient (p value)
Average Blood pressure	Microalbuminuria	0.657** (p- 0.000)
	LV mass index	0.719** (p- 0.000)
	Carotid IMT	0.339** (p- 0.008)
	Fundus	0.478** (p- 0.000)

\*\*Correlation is significant at 0.01 levels

There is a connection between normal circulatory strain and target organ harm. Microalbuminuria (p-0.000), LV mass file (p-0.000), carotid IMT (p-0.008), and Fundus (p-0.008) (p-0.000).

**Table 8: Correlation of Components of Metabolic Syndrome with Uric Acid and Target Organ Damage**

Characteristic	Uric Acid (cc / p value)	Microalbuminuria (cc / p value)	LV mass index (cc / p value)	Carotid IMT (cc / p value)
BMI	0.160 (p-0.221)	0.649 (p- 0.000)**	0.423** (p-0.001)	0.222 (p- 0.088)
Waist circumference	0.190 (p- 0.146)	0.328 ( p- 0.011)*	0.271* (p-0.036)	0.153 (p-0.243)

\*\*Correlation is significant at 0.01 levels

\* Correlation is significant at 0.05 levels

BMI, Microalbuminuria, and LV mass list have a genuinely huge affiliation.

There is a measurably critical relationship between abdomen perimeter, microalbuminuria, and LV mass file.

**Table 9: Correlation of Parameters of Target Organ Damage with Uric Acid Levels**

Characteristic	No. of cases	Mean uric acid levels	SD	t-test
uric acid	LV mass Index			
	Normal	10	4.90	1.449
	Abnormal	50	8.40	0.670
Carotid IMT				
uric acid	Normal	12	5.50	1.931
	Abnormal	48	8.40	0.676
uric acid	Microalbuminuria			
	Normal	11	5.27	1.849
	Abnormal	49	8.39	0.671

There was a measurably critical distinction in mean uric acid levels with LV mass file, carotid IMT, and Microalbuminuria. (p-0.000).

**Table 10: Correlation of Parameters of Fundus Damage with Uric Acid Levels**

S.No.	Parameter	No. of cases	Mean uric acid levels	SD	t-test
1	GRADE 1	08	4.63	1.061	p- 0.000
2	GRADE II	42	8.31	0.950	
3	GRADE III	10	7.82	0.201	

There is a genuinely huge distinction in mean uric acid leaves between Grade 1 and Grade 2 fundal anomalies, just as between Grade 1 and Grade 3 fundal changes (p-0.000).

The variations in changes between Grades 2 and 3 are not statistically significant (p-1.000).

## Discussion

The critical finding of our review was that blood uric acid focuses are related with Microalbuminuria, expanded Carotid IMT, expanded LV mass list, and Fundus changes in fundamental hypertension patients.

There is a positive link between average blood pressure and damage to the target organ. Microalbuminuria (p- 0.000), LV mass index (p- 0.000), carotid IMT (p- 0.008), and Fundus (p- 0.008) (p- 0.000).

A few examinations have been directed to research the relationship between blood uric acid levels and the commonness and seriousness of target organ harm. Only a few studies have been compared to the current study's conclusions in terms of each parameter.

The members in this review fluctuated in age from 18 to 60 years of age, with a normal period of  $41.7 \pm 12.3$  years, which was reliable with the discoveries of the past investigations. Sandra N Ofori et al [11] discovered a 31–70 year age range, with a mean age of  $46.8 \pm 9.3$  years. The findings confirmed the prior investigation's findings. Abidemi Jude Fasae et al [12], on the other hand, discovered that participants varied in age from 19 to 85 years old, with a mean age of  $50.4 \pm 12.3$  years.

Males made up roughly 68.1 percent (38/60) of the present research participants, while females made up approximately 31.8 percent (22/60), for a male-to-female ratio of 1.7:1. In Abidemi Jude Fasae et al [12], 34.7 percent of the 150 newly diagnosed hypertension patients were men, whereas 65.3 percent were females. In this study, the male-to-female ratio was 0.5:1. Sandra N Ofori et al's research [11] found a male-to-female ratio of 1:1.9, with 66.1 percent men and 33.8 percent females. As a consequence, our findings matched those of other studies.

A smoking history was reported by 20% of the patients in this research, with a p value of 0.63 suggesting that it was not significant. C Tsioufis et al [13] discovered that 31.1 percent of the people smoked, with a p value of not significant. In a study conducted by KumralCagli et al [14], 23.3 percent of participants had a smoking history, with a p value of 0.43.

**Table 11: Comparative Studies Related With Blood Pressure**

Related With Blood Pressure	Mean SBP	Mean DBP	P VALUE
Abidemi Jude Fasae et al study [12]	$175 \pm 24.0$ mmHg	$106 \pm 16.4$ mmHg	SBP- $p < 0.0001$ DBP- $p < 0.0001$
Sandra N Ofori et al study [11])	$158.8 \pm 15.9$ mmHg	$95.9 \pm 11.1$	SBP- $< 0.001$ DBP- $< 0.001$
KumralCagli et al study [14]	159.0 (148.0–174.0) mmHg	99.0 (90.3–113.0) mmHg	SBP-0.03 DBP-0.03
C Tsioufis et al study [13]	$150 + 19.31$ mmHg	$97 + 11.56$ mmHg	SBP- NS DBP- 0.02
Present study	158.25 mmHg	95 mmHg	SBP- p- 0.000 DBP- p- 0.000

In the current review, the mean SBP was 158.25 mmHg and the mean DBP was 95 mmHg, with a measurably huge contrast in mean uric acid levels. The mean SBP and DBP of hypertension patients in Abidemi Jude Fasae et al [12] research are  $175 \pm 24.0$  mmHg and  $106 \pm 16.4$  mmHg, respectively. The mean SBP and DBP of hypertension patients in Sandra N Ofori et al research [11] was  $158.8 \pm 15.9$  mmHg and  $95.9 \pm 11.1$  mmHg, respectively.

The mean SBP and DBP of hypertension patients in KumralCagl, MD et al studies (14) are 159.0 mmHg and 99.0 mmHg, respectively. The mean SBP and DBP of hypertension patients in CTsioufis et al [13] research was 150 +19.31mmHg and 97 + 11.56mmHg, respectively. In the present study, mean BMI was 23.79 with p value 0.01 which was significant and In Abidemi Jude Fasae et al [12] study mean BMI was 23.3 with p value <0.0001 which was significant in their study

Sandra N Ofori et al [11] found that the mean BMI was 29.05.0, with a p value of 0.0001 indicating that their study was significant. In KumralCagli, MD et al study (14) mean BMI was 27.2 p value <0.0001 which was significant in their study. In CTsioufis, et al [13] study mean BMI was 28.5 with p value not significant in their study.

### **Comparative Studies Related With ECG**

In the current examination, 85% of the patients had ECG changes characteristic of left ventricular hypertrophy. Abidemi Jude Fasae et al [12] study, observed abnormal ECG in 86.1% of hypertensive patients. LVH was found in 55.4% of patients in a research done by Sandra N Ofori et al [11]. In the current review, electrocardiographic proof for LVH was viewed as in 10% of the people, though echocardiographic proof was seen as in 51%.

### **Comparative Studies Related to Microalbuminuria**

Microalbuminuria was found in 78.3 percent of hypertension patients in the current research. In Sandra N Ofori et al [11] research, the prevalence of microalbuminuria was 54.1 percent of the patients. The key finding of the C Tsioufis et al [13] study was that SUA concentrations in individuals with essential hypertension are linked with increased urine albumin excretion. Increased LV mass index, on the other hand, is not one of them.

Grade I retinopathy was detected in 13.3 percent of cases, grade II in 70% of cases, and grade III in 16.6 percent of cases in the current research. Because only three individuals were diagnosed with grade IV hypertensive retinopathy, the grade 4 and grade 3 groups were pooled for analysis. In the Xuling Chen et al research (15), hypertensive retinopathy was found in 75.95% of the participants. Grade 1 in 58.80%, grade 2 in 14.81%, and grade 3 in 2.34%.

### **Conclusion**

As indicated by the review, hyperuricemia is related to LVH, which is a typical objective organ for harm and an expanded danger of cardiovascular occasions in hypertension. Therefore, individuals with hypertension ought to have their Uric acid levels assessed consistently.

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