https://doi.org/10.29309/TPMJ/2023.30.02.6664

The Professional Medical Journal
www.theprofesional.com
2023, Volume, 30 Issue, 02

ORIGINAL ARTICLE

Serum Uric acid in essential hypertension and its correlation with left ventricular hypertrophy.

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Article Citation: Balouch IJ, Memon KA, Bano S. Serum Uric acid in essential hypertenison and its correlation with left ventricular hypertrophy. Professional Med J 2023; 30(02):178-182. https://doi.org/10.29309/TPMJ/2023.30.02.6664

ABSTRACT… Objective: To estimate serum uric acid in essential hypertension and its correlation with left ventricular hypertrophy (LVH) in patients presenting at a tertiary care hospital. **Study Design:** Cross Sectional study. **Setting:** Department of Cardiology and Medicine, BMC Liaquat University of Medical and Health Sciences Jamshoro/Hyderabad and NICVD Hyderabad, Sindh. **Period:** July 2018 to January 2021. **Material & Methods:** A sample of 100 diagnosed cases of essential hypertenison (group A), 100 essential hypertenison with LVH cases (group B) and 100 age matched healthy control (group C) was selected through non- probability convenient sampling. Echocardiography findings of cases and control were noted. Serum uric acid, urea and creatinine were measured form sera. LVH was defined by Devereux's formula. Continuous variables were analyzed Student`s Independent samples t – test and Pearson`s correlation was used for essential hypertension and LVH on SPSS ver. 21.0 at 95% Confidence interval ($P \leq 0.05$). **Results:** Serum uric acid in EH, EH+LVH and controls was noted as 5.5±1.0, 5.8±1.9 and 3.81±1.2 mg/dl (P-0.0001). LV in EH, EH+LVH and controls was measured as 10.8±2.3, 16.4±3.3 and 9.6±0.2 mm in 3 study groups (P-0.0001). Uric acid proves statistically significant linear correlation in EH+LVH revealing positive correlation ($r=0.475$), ($P=0.0001$). **Conclusion:** The present study reports serum Uric acid is found elevated in essential hypertension and essential hypertension with left ventricular hypertrophy. Uric acid shows positive correlation with left ventricular hypertrophy.

Key words: Essential Hypertension, Left Ventricular Hypertrophy, Uric Acid.

INTRODUCTION

Essential hypertension is a condition of chronic sustained rise in systemic blood pressure because of unknown cause. Global estimate of essential hypertension is 1 billion people living with condition. WHO estimates show the burden will rise to 1.56 billion by the year 2025 affecting 29.2% of World population.[1,2] Estimates of World prevalence of hypertension show a rise from 594 million in 1975 to 1.13 million in 2015.[1,3] Currently, 30% adult population of developed countries is affected by hypertension and is estimated to rise to 60% within decade. In developing countries the condition is even worse affecting nearly 80% of population.[1,3] National Health Survey reported 19.1% prevalence while another study reported 15% prevalence of hypertension in Pakistan.[1] Hypertension precludes diabetes mellitus, renal disease, smoking, obesity, sedentary life style and socio-economic problems in Pakistan.[1] Long standing uncontrolled essential hypertension often causes of hypertrophy of left ventricle (LVH) due to increased pressure strain. LVH is forerunner of cardiac failure, ischemic heart disease and associated morbidity and mortality. Currently, much interest has been observed on the association of LVH and serum uric acid in essential hypertension. Serum uric acid is regarded as a cardiovascular risk factor in clinical studies.[4] Elevated uric acid has been associated with metabolic syndrome, insulin resistance, diabetes mellitus, coronary artery disease, renal disease, and dyslipidemia, etc.[4,5] Enhanced cardiovascular (CV) risk has been reported in those with elevated uric acid levels.[5] Elevated serum uric acid is predicted to increase the risk

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Article received on: 21/06/2021
Accepted for publication: 21/12/2021

of systemic hypertension, dyslipidemia, renal disease, etc.[6,7] Serum uric acid is reported as a cardiovascular risk factor of target organ damage (TOD) in essential hypertension.[6,7] Search of published literature shows meager research on the association of serum uric acid with left ventricular hypertrophy in essential hypertension.[4-7] As uric acid is an independent predictor of cardiovascular morbidity in essential hypertension[6,7], but national literature show few studies on this association. In Pakistan, there is rising prevalence and large number of populations is suffering from essential hypertension[1] hence it is needed to conduct more studies on the topic.

The present study was planned to estimate serum uric acid in essential hypertension and its correlation with left ventricular hypertrophy (LVH) in patients presenting at a tertiary care hospital.

MATERIAL & METHODS

A cross sectional investigational study was planned according to the study protocol. The place of study was the Department of Cardiology and Medicine, BMC Liaquat University of Medical and Health Sciences Jamshoro/Hyderabad and NICVD Hyderabad, Sindh from July 2018 to January 2021.

Every patient went through a meeting to meet inclusion and exclusion standards, and reason for concentrate for volunteer purpose. Consultant physician and cardiologist analyzed the patients and findings were noted in a pre – structured proforma. Blood pressure was estimated by Palpatory and Auscultatory techniques following five minutes rest. Expert cardiologist performed out the Echocardiography [(2.5 MHz – 3D cardio probe) (Model – SSA 270; Toshiba organization Japan)]. Devereux's formula was utilized for assessment of LV thickness (LVH).[7] Inclusion measures of cases were analyzed instances of long standing essential hypertension as indicated by the JNC – VIII criteria, LVH (Devereux's equation formula), age 40 – 60 years, volunteers and either sex. Patients experiencing secondary hypertension, diabetic hypertensive patients, chronic kidney and liver diseases, cardio failure, ischemic heart disease (IHD), coronary syndrome were rejected/excluded from study.

A sample of 100 diagnosed cases of essential hypertenison (group A), 100 cases of essential hypertension with left ventricular hypertension (group B) and 100 age matched normal health subjects (group C) were selected according to non – probability convenient sampling. Venous blood samples were taken from a peripheral vein by venipuncture with a 5 ml disposable syringe (BD, Beckton Dickinson, USA). Samples were centrifuged at x3000 rpm for fifteen minutes. Sera were taken separated for biochemical analysis of serum uric acid, urea and creatinine by a consultant pathologist the Diagnostic and Research Laboratory of Liaquat University. Data were saved in a patient proforma designed for study protocol. Continuous variables were analyzed One – ANOVA and post – Hoc LSD testing. Linear Pearson`s correlation was run for determining association of serum uric acid with essential hypertension and left ventricular hypertrophy. Variables were analyzed on SPSS ver. 21.0 at 95% Confidence interval ($P \leq 0.05$).

RESULTS

Age, body weight, systolic and diastolic BP, urea, creatinine, uric acid and left ventricular hypertrophy is described in Table-I among 3 groups. Participants were age matched ($P=0.87$) normal renal functions (urea and creatinine) ($P>0.05$). Body weight, systolic and diastolic BP proved statistically significant ($P=0.00001$). Uric acid in EH, EH+LVH and controls was noted as 5.5 ± 1.0, 5.8 ± 1.9 and 3.81 ± 1.2 mg/dl (P-0.0001) (Figure-1). LV in EH, EH+LVH and controls was measured as 10.8 ± 2.3, 16.4 ± 3.3 and 9.6 ± 0.2 mm in 3 study groups (P-0.0001) (Table-I). Uric acid proves statistically significant linear correlation in EH+LVH revealing positive correlation ($r=0.475^{**}$), ($P=0.0001$) (Figure-2).

DISCUSSION

We are the first to show high normal serum uric acid levels in essential hypertension (EH) and EH with left ventricular hypertrophy (LVH) in patients presenting at our tertiary care hospital.

	EH	EH+LVH	Control	F-value	P-value
Age (years)	50.6±5.7	50.5±4.7	50.6±5.6	3.01	0.87
Body Weight (Kg)	77.4±12.2	78.4±13.9	82.1±13.5	6.76	0.02
Systolic BP (mmHg)	145.8±21.2	147.8±21.9	118.6±4.9	84.3	0.0001
Diastolic BP (mmHg)	80.9±11.1	80.5±15.6	70.5±2.1	22.5	0.0001
Serum uric acid (mg/dl)	5.5±1.0	5.8±1.9	3.81±1.2	99.8	0.0001
Urea (mg/dl)	28.3±9.5	30.0±10.7	29.9±10.6	2.5	0.80
S. Creatinine (mg/dl)	0.95±0.1	0.97±0.3	0.96±0.2	4.3	0.14
LVH (mm)	10.8±2.3	16.4±3.3	9.6±0.2	237.0	0.0001
EH- Essential hypertension, LVH-left ventricular hypertrophy					

Table-I. Findings of cases and control

	EH	EH+LVH	Control
r-value	0.181	0.475**	0.141
p-value	0.071	0.0001	0.67
**. Correlation is significant at the 0.01 level (2-tailed).			

Table-II. Correlation of serum uric acid with LVH

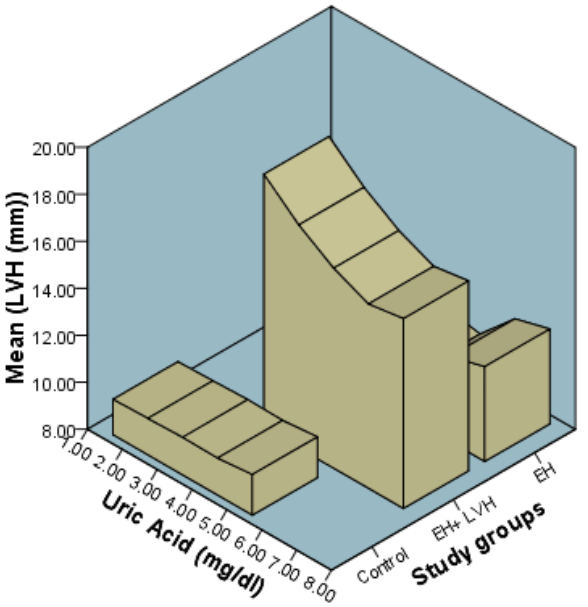

Figure-1. Graph shows mean LVH and Uric acid among study groups

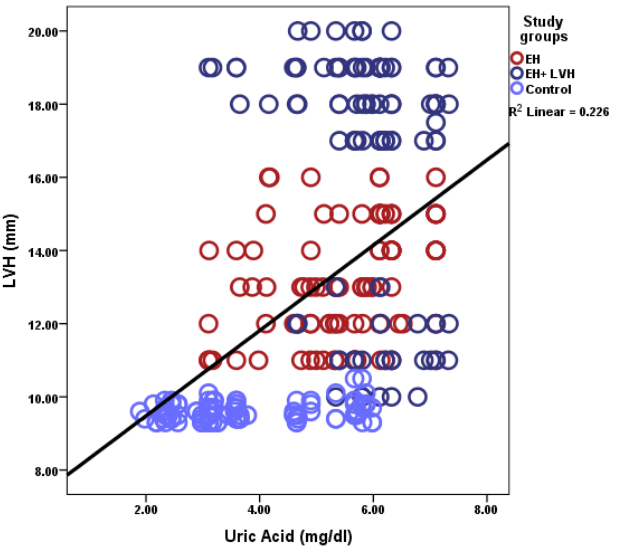

Figure-2. Correlation of Serum uric acid and LVH in study groups

We found uric acid in EH, EH+LVH and controls was noted as 5.5±1.0, 5.8±1.9 and 3.81±1.2 mg/dl (P-0.0001) (Figure-1). High normal serum uric acid levels of present study are in keeping with previous studies.[9,10] Uric acid shows statistically significant positive linear correlation in EH+LVH revealing positive correlation with left ventricular diameter (r=0.475**), (P=0.0001) (Table-II, Figure-2). For the first time, in a real life situation, the present study shows the positive linear correlation of serum uric acid with left ventricular hypertrophy. The findings are in agreement with a recent study.[7] Visco et al (2020)[7] analyzed large sample of 1379 hypertension cases and confirmed independent correlation of serum uric acid and left ventricular mass index (LVMi). In multivariate analysis, the cut – off point of 5.6 mg/dl predicted the LV size. They suggested raised serum uric acid might help for risk stratification of cardiac size in essential hypertension. The findings of above study are in agreement with previous studies.

Our findings agree with growing role that the

serum uric acids may be used as a predictive measure in EH patients. It has been suggested the serum uric acid may identify EH patients with target organ damage (TOD).[7] However, the precise relationship of underlying association of uric acid and LVH remains to be elucidated. Linking of the two phenotypes needs further elaboration of pathophysiological mechanisms. A possible link of serum uric acid and LVH is through release of TNF-α (tumor necrosis factor - alpha) stimulated MAPK (mitogen-activated protein kinases) and through activation of RAAS (renin–angiotensin - aldosterone) system that in turn promote cardiac hypertrophy.[11,12] Cicero et al[13] reported the serum uric acid increases the after – load of left ventricle through increased pulse wave velocity (PWV) and augmentation index resulting in LV hypertrophy. It has been also suggested the serum uric acid levels reflect eh activity of xanthine oxidase and oxidative stress that play role in cardiac hypertrophy.[14]

In recent years, the serum uric acid has attained renewed emphasis regarding the patients at risk of developing cardiovascular risk.[7,15] It has been reported that the high uric acid combined with LVH is an independent powerful predictor of cardiovascular risk of cardiac failure, angina pectoris, myocardial infarction and transient cerebral ischemia.[16] A previous studies[17] reported positive correlation of serum uric acid with LVH in 540 CKD patients and renal transplant patients.[18] The findigns of above studies are in support to the present study. However, few studies have produced conflicting data showing no independent correlation of uric acid levels and LV size[19,20] while other studies have shown gender based positive correlation of uric acid and LV size.[21,22] Conflicting results of above studies might be related to different methodologies, patient selection and heterogeneity characteristics. Nakanishi et al found independent positive correlation of serum uric acid and LV dysfunction in general population without overt cardiac disease.[23] The findings of present observation case control study suggest the serum uric acid might be helpful in predicting the cardiac hypertrophy in essential hypertension. Only limitation of present study is the small sample size and peculiar ethnicity of study population.

CONCLUSION

Serum Uric acid is found elevated in essential hypertension and essential hypertension with left ventricular hypertrophy. Uric acid shows positive correlation with left ventricular hypertrophy. Serum uric acid may be screened in essential hypertension patient for predicting development of left ventricular hypertrophy. Large scale studies are warranted to establish the cause-effect relationship and predictive significance of serum uric acid in essential hypertension in our indigenous population.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Iram Jehan Balouch	Patient collection, Echocardiography, Data collection.	
2	Khalil Ahmed Memon	Biochemical analysis, Data results, Introduction.	
3	Safia Bano	Manuscript, Data analysis, Final proof reading.	