European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 9, Issue 7, Summer 2022

ORIGINAL RESEARCH

Assessment of relationship between serum uric acid and ejection fraction of the left ventricle

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Received: 24 September, 2022 Accepted: 26 October, 2022

ABSTRACT

Background: It has been proved that the prevalence of reduced ejection fraction heart failure (refHF) is decreasing, with a stabilization of mid-range ejection fraction heart failure (mrHF) prevalence and rise in number of patients with preserved ejection heart failure. The present study was conducted to assess relationship between serum uric acid and ejection fraction of the left ventricle.

Materials & Methods: 48 patients of chronic heart failure of both gendersunderwent cardiac ultrasound. Measurement of planimetric ejection fractions and left atrial volume were taken. Patients were divided into 3 groups based on ejection fraction. Group I had EF >50%, group II between 40-49% and group III had <40%. 5 ml venous blood samples were taken, and measurements of biochemical parameters such as serum electrolytes (Na+ and K+), serum creatinine (SC), and a lipid panel and serum uric acid (SUA) were performed. SUA was measured. NT-proBNP levels were also measured for all patients.

Results: Out of 48 patients, males were 30 and females were 18. The mean Na+ (mmol/L) was 139.2, 139.4 and 139.1, K+ (mmol/L) was 4.5, 4.7 and 4.9, S. creatinine (mg/dL) was 1.5, 1.6 and 1.9, eGFR (MDRD) (mL/min) was 46.7, 42.3 and 42.1, S. uric acid (mg/dL) was 7.9, 7.1 and 7.5, NT-proBNP was 2456.3, 3654.3 and 6714.5 and LAV (mL) was 64.2, 81.4 and 103.5 in group I, group II and group III respectively. The difference was significant (P< 0.05).

Conclusion: There was association of increased serum uric acid with the level of the ejection fraction of the left ventricle.

Key words: Cardiomyopathy, ejection fraction, heart failure

INTRODUCTION

Cardiomyopathy is referred to a disease target the myocardium and negatively affecting cardiac function. Cardiomyopathy is of several types in children, dilated cardiomyopathy (DCM) is the most common and is characterized by ventricular dilatation and systolic dysfunction in the absence of hypertension, valvular, congenital, or ischemic heart disease.[1]

It has been proven that the prevalence of reduced ejection fraction heart failure (refHF) is reducing, with a stabilization of mid-range ejection fraction heart failure (mrHF) prevalence and an increasing number of patients with preserved ejection heart failure (pefHF).[2] The trend

of decreasing incidence of refHF is due to multiple factors, including the improvement of cardiovascular therapies, better access to healthcare, improved revascularization techniques, a reduced time from event to stent placement and public campaigns to raise awareness.[3]
The end-product of purine metabolism is UA , considered a powerful free-radical scavenger in human plasma for protecting endothelial cells against damage by exogenous oxidants.[4] Elevated levels of serum UA have been identified as potential factors for gout, hypertension, abnormal glucose metabolism, and dyslipidemia.Uric acid is also mentioned as a routine parameter that needs to be checked when assessing the cardiovascular risk of a patient.[5]The present study was conducted to assess relationship between serum uric acid and ejection fraction of the left ventricle.

MATERIALS & METHODS

The present study comprised of 48 patients of chronic heart failure of both genders. Written consent for the participation in the study was obtained from their family members.
Data such as name, age, gender etc. was recorded. Patients underwent cardiac ultrasound. Measurement of planimetric ejection fractions and left atrial volume were taken. Patients were divided into 3 groups based on ejection fraction. Group I had EF >50%, group II between 40-49% and group III had <40%. 5 ml venous blood samples were taken, and measurements of biochemical parameters such as serum electrolytes (Na+ and K+), serum creatinine (SC), and a lipid panel and serum uric acid (SUA)were performed. SUA was measured. NT-proBNP levels were also measured for all patients during the first 24 hours after admission and expressed in pg/mL.Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 48		
Gender	**Males**	**Females**
Number	30	18

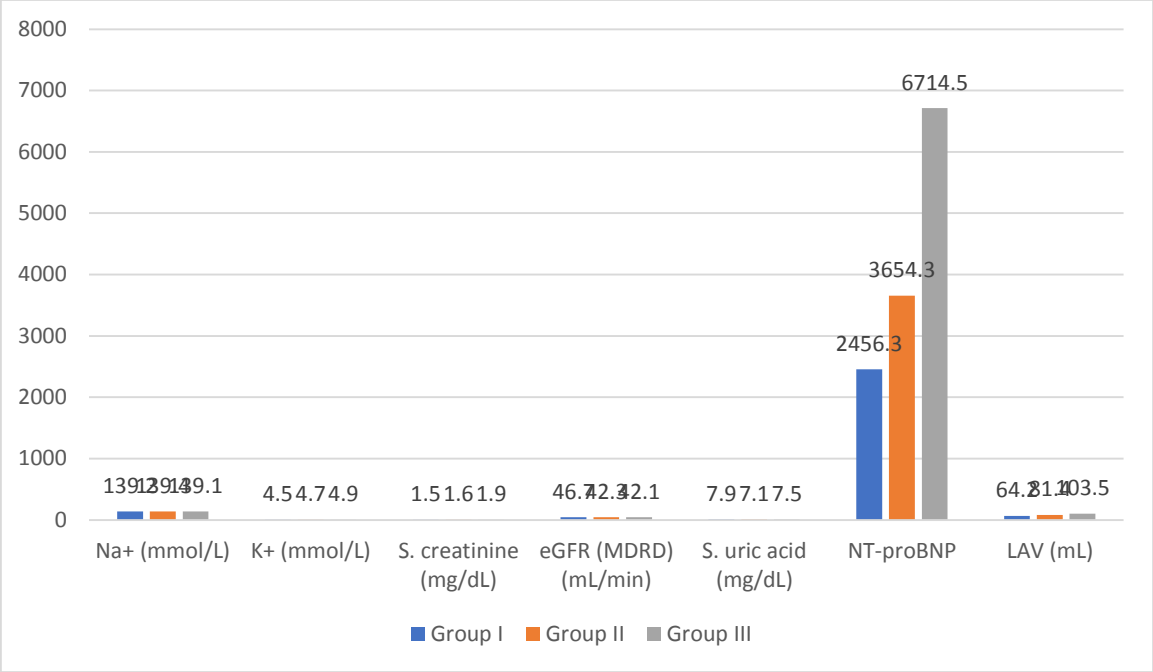
Table I shows that out of 48 patients, males were 30 and females were 18.

Table II Assessment of parameters

Parameters	Group I	Group II	Group III	P value
Na+ (mmol/L)	139.2	139.4	139.1	0.92
K+ (mmol/L)	4.5	4.7	4.9	0.94
S. creatinine (mg/dL)	1.5	1.6	1.9	0.26
eGFR (MDRD) (mL/min)	46.7	42.3	42.1	0.12
S. uric acid (mg/dL)	7.9	7.1	7.5	0.88
NT-proBNP (pg/mL)	2456.3	3654.3	6714.5	0.02
LAV (mL)	64.2	81.4	103.5	0.01

Table II, graph I shows that mean Na+ (mmol/L) was 139.2, 139.4 and 139.1, K+ (mmol/L) was 4.5, 4.7 and 4.9, S. creatinine (mg/dL) was 1.5, 1.6 and 1.9, eGFR (MDRD) (mL/min) was 46.7, 42.3 and 42.1, S. uric acid (mg/dL) was 7.9, 7.1 and 7.5, NT-proBNP(pg/mL)was2456.3, 3654.3 and 6714.5 and LAV (mL) was 64.2, 81.4 and 103.5 in group I, group II and group III respectively. The difference was significant (P< 0.05).

Graph I Assessment of parameters



DISCUSSION

One of the risk factors for cardiovascular diseases is uric acid levels and hyperuricemia with established data for prognosis and increasing evidence that uric acid is an independent risk factor for the development of cardiovascular diseases, even where the patient does not have levels of serum uric acid (SUA) consistent with gout.[6]Moreover, isolated hyperuricemia (irrespective of renal function and administration of drugs like to be a marker of altered oxidative metabolism, related with tissue hypoxia, which could damage cardiomyocytes and vascular endothelium. Moreover, this can disturb myocardial contractility, vasoconstriction and may negatively affect the cardiovascular system and potentially make worse the prognosis in patients with heart failure.[7]

Uric acid can also regulate granulocyte adherence to the endothelium, and peroxide and superoxide free radical production, therefore, uric acid traverses dysfunctional endothelial cells which accumulate as crystal within atherosclerotic plaques.[8] These crystals may lead toplaque progression and local inflammation and crystal accumulation may be greater in patients with raised serum uric acid concentration. These effects of uric acid can lead to ischemic cardiomyopathy and then post-ischemic heart failure.[9]The present study was conducted to assess relationship between serum uric acid and ejection fraction of the left ventricle.

We found that out of 48 patients, males were 30 and females were 18.Ivan VSet al[10]assessed the direct relationship between serum uric acid and the ejection fraction. According to the ESC guidelines, a retrospective study of 303 patients with heart failure,, was conducted, and several parameters, along with the relationship between serum uric acid and ejection fraction, were characterized. A direct connection between the level of serum uric acid &the ejection fraction was given (p = 0.03); patients with higher uric acid had ahigh risk of having a lower ejection fraction. Even when asymptomatic, serum uric acid is linked with the level of the ejection fraction of the left ventricle.

We found that mean Na+ (mmol/L) was 139.2, 139.4 and 139.1, K+ (mmol/L) was 4.5, 4.7 and 4.9, S. creatinine (mg/dL) was 1.5, 1.6 and 1.9, eGFR (MDRD) (mL/min) was 46.7, 42.3 and 42.1, S. uric acid (mg/dL) was 7.9, 7.1 and 7.5, NT-proBNP was 2456.3, 3654.3 and 6714.5 and LAV (mL) was 64.2, 81.4 and 103.5 in group I, group II and group III

respectively. Mets et al[11] reported therates of mortality and cardiac transplantation for childrenwith DCM to be as high as 20% and 25%, respectively. Li et al[12] assessed relationship between serum UA level and DCM in children, and analyzed the changes and clinical correlation of the two. In the case group, 49 children included 17 males and 32 females, aged from 2 to 172 months. The case group further divided into New York Heart Association (NYHA) functional class I (n=2), class II (n=17), class III (n=11), and class IV (n=19). The selection of 44 healthy children done as the control group that includes 20 males and 24 females aged from 2 to 161 months. The serum UA level was done, and an ultrasonic cardiogram was conducted in each child. The serum UA level, left ventricular end-diastolic diameter (LVEDD), left ventricular end-systolic diameter (LVESD), and left atrial diameter (LAD) of the case group were higher than that of the control group, while the left ventricular ejection fraction (LVEF) and left ventricular fractional shortening (LVFS) were lower than that of the control group, and significant statistical differences were seen between the two groups.

Ezzat et al[13]observed significantly higher mean serum uric acid levels in patients with congestive heart failure versus apparently healthy persons. When we adjusted the serum uric acid with other significant risk factors in the univariate analysis which were age, gender and smoking, serum uric acid was an independent risk factor "P value = 0.04". There was a significant correlation between serum uric acid level and the severity of congestive heart failure. High rates of serum uric acid levels were recorded in patients with reduced ejection fraction. A uric acid level of 8.45 mg/dl was found to be the most appropriate cut-off point with the sensitivity 62% and the specificity 78.5%.

The limitation the study is small sample size.

CONCLUSION

Authors found that there was association of increased serum uric acid with the level of the ejection fraction of the left ventricle.

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