Original Research Article

Observational Study to Evaluate the Correlation among Left Ventricular Ejection Fraction and Serum Uric Acid Level in Type 2 Diabetic Patients with Diastolic Heart Failure

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ABSTRACT

Objective: The main objective of this study is to evaluate the correlation among left ventricular ejection fraction and serum uric acid level in type 2 diabetic patients with diastolic heart failure.

Methods: This was a retrospective study which was conducted at a tertiary out patients department clinic in Bihar. Patients' data were recorded from the patients OPD chart, clinical reports and mainly from the clinical records maintain at the investigation centres. Demographic data were collected by using predesigned proforma in Microsoft excel sheet and serological test data were noted from patient clinical record sheet.

Results: It was observed that 70% of patients were having ejection fraction less than 40 along with serum uric acid level bellow 6.8 mg/dl where as 30% had high uric acid levels with ejection fraction >40. The difference between this two category was statistically significant (P=0.001). It is observed that in patients with heart failure poor prognosis is associated with high uric acid and it is statistically significant, p = 0.001

Conclusion: Low levels of ejection fraction are significantly correlated with the high levels of serum uric acids. This study also concludes that in diabetic heart failure uric acid is an important prognostic factor.

Keywords: Diabetes, uric acid level, ejection fraction, diastolic heart failure.

INTRODUCTION

The combination of hyperglycemia, hypertension, obesity, dyslipidemia and atherosclerosis that is seen commonly with diabetes mellitus increases the risk of systolic and diastolic left ventricular (LV) dysfunction and often leads to heart failure in diabetic patients, this explains the more common occurrence of this syndrome in diabetic patients [1-4]. In the United Kingdom Prospective Diabetic Study (UKPDS), the incidence of heart failure correlated with the extent og hyperglycemia, each 1% increase in hemoglobin A1c (HbA1c) levels was associated with a 12% increase in heart failure risk [5]. Several pathophysiologic mechanisms seem to be responsible. Diabetes is a risk factor for the development of coronary atherosclerosis with resultant myocardial ischemia and infraction, diabetes is associated frequently with the presence of hypertension, a factor in the pathogenesis of approximately 70% of all heart failure cases, and diabetes causes the development of a specific diabetic cardiomyopathy independent of the presence of coronary atherosclerosis that results from the metabolic derangements that are present in diabetes [6]. Thus, diabetes mellitus is a major population attributable risk factor for the development of heart failure.

Heart failure is not a diagnosis but is a clinical syndrome that results from progression of cardiomyopathy, which is defined simply as disease of heart muscle. Diabetes produces adaptive and maladaptive myocardial responses, altered metabolism and impaired insulin action in heart and

skeletal muscle are cause and consequences of altered cardiac function [8]. Diabetes mellitus together with hypertension and associated comorbidities, produces structural damage in the heart that manifests as ventricular dysfunction, and ultimately, as diastolic heart failure [9].

The main objective of this study is to evaluate the correlation among left ventricular ejection fraction and serum uric acid level in type 2 diabetic patients with diastolic heart failure.

METHOD

This was a retrospective study which was conducted at a tertiary out patients department clinic in Bihar. Patients' data were recorded from the patients OPD chart, clinical reports and mainly from the clinical records maintain at the investigation centres. Any patients who were diabetic and having documented heart failure were included in this study. Patients who were fails to maintain their clinical reports, discontinued their treatment for any reason and the patients who denied to participate in the study were excluded. Study also excludes pregnant women, minors and patients with chronic kidney disease, Cardiomyopathies, Valvulopathies, Gout or any autoimmune disease.

For those patients who fulfils the inclusion criteria a sign informed consent were obtained.

Demographic data were collected by using predesigned proforma in Microsoft excel sheet and serological test data were noted from patient clinical record sheet.

Microsoft excel sheet were used to collect the data thereafter with help of SPSS 22.0 data were analysed. A descriptive bivariate analysis was performed; for the chi-squared distribution, significance was assumed to be <0.05.

RESULT

170 patients' data were evaluated in this retrospective observational study. This study population further categorized based on age distribution, gender distribution, influence on serum uric acid and NYHA classification.

Table 1: Age Distribution of the study populations

Age distribution	N (%)
40 – 50	55 (32%)
51- 60	65 (38%)
61 – 70	37 (22%)
71 - 80	11 (7%)
> 80	2 (1%)

Table 2: Gender Distribution

Sex	Number of patients
Female	72
Male	98

Table 3: Distribution based on NYHA

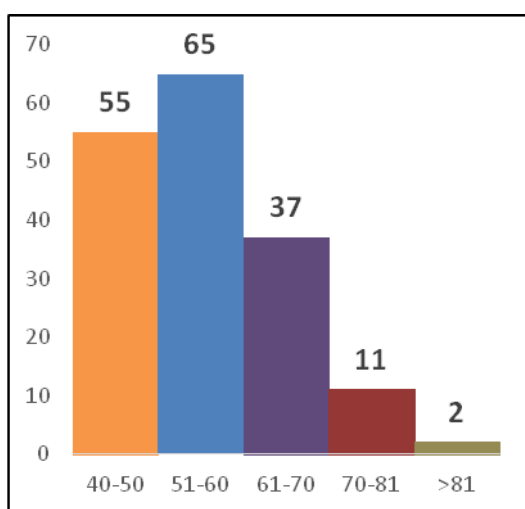| NYHA Class	N (%)
I	24 (14%)
II	74 (44%)
III	55 (32%)
IV	17 (10%)

Figure 1: Age Distribution of the study populations
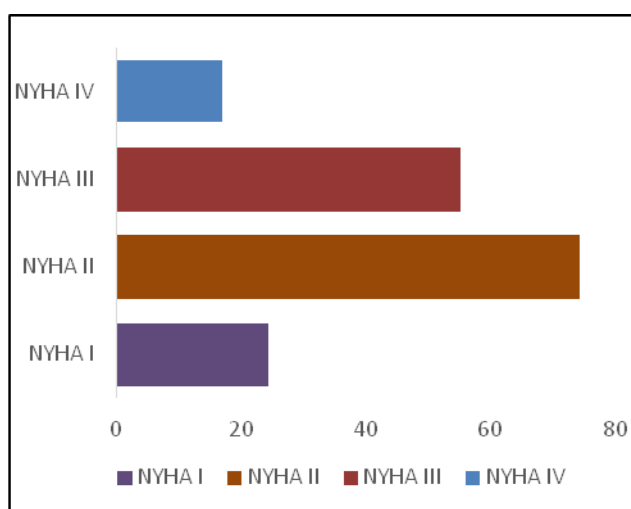
Figure 2: Distribution based on NYHA

Table 3: Distribution of Uric Acid level

Uric Acid Level (mg/dl)	N (%)
> 6.8	97 (57%)
< 6.8	73 (43%)

It was observed that 70% of patients were having ejection fraction less than 40 along with serum uric acid level bellow 6.8 mg/dl where as 30% had high uric acid levels with ejection fraction >40. The difference between this two category was statistically significant (P=0.001).

Table 5: Correlation between EF and serum uric acid

Uric Acid Level (mg/dl)	Ejection Fraction N (%)		Overall N (%)
	< 40	> 40	
< 6.8	22 (30%)	51(70%)	73 (43%)
> 6.8	68 (70%)	29 (30%)	97 (57%)

It is observed that in patients with heart failure poor prognosis is associated with high uric acid and it is statistically significant, p = 0.001.

Table 6: Correlation between Uric Acid and Prognosis

Prognosis	Serum uric acid N (%)		Overall N (%)	P Value
	< 6.8	> 6.8		
Dead	3 (4.1%)	22 (22.7%)	25 (14.7%)	0.001
Alive	70 (95.9%)	75(77.3%)	145 (85.3%)	

DISCUSSION

The clinical manifestations of diabetic heart disease include atherosclerosis and ischemic cardiomyopathy, diabetic cardiomyopathy and diabetic autonomic neuropathy, the pathophysiologic process includes macrovascular disease. Microvascular disease, myocellular hypertroply and fibrosis, and autonomic nerve fibre degeneration. Although the macrovascular component atherosclerosis generally receives the greatest attention, it represents only one component of the cardiovascular disease process that is caused by diabetes mellitus. Cardiovascular disease, including coronary artery disease, cerebrovascular disease, and peripheral vascular disease, is the most common cause of death in diabetic patients, most deaths result from coronary artery disease [10].

Significant association between left ventricular ejection fraction and serum uric acid was revealed in current study which was in agreement with the study by Deveci et al [11]. In current study it was observed that 70% of patients were having ejection fraction less than 40 along with serum uric acid level bellow 6.8 mg/dl where as 30% had high uric acid levels with ejection fraction >40. The difference between this two category was statistically significant (P=0.001). This findings was in line with the findings of some previous studies [12,13].

Diabetic cardiomyopathy encompasses the spectrum from subclinical disease to the full blown syndrome of diastolic heart failure. The prevalence of type 2 diabetes mellitus is increasing at an alarming rate in the western world, and with it, the frequency of diabetes related heart failure. There is at least early suggestion that target driven, long term, untensified intervention that is aimed at multiple risk factors in patients who have type 2 diabetes and microalbuminuria may reduce the risk of macrovascular (cardiovascular) and microvascular complications by approximately 50% [14]. Thus, it is imperative that patients, particularly those who are at risk for the cardiovascular dysmetabolic syndrome, be screened aggressively for the presence of glucose intolerance and diabetes. When detected, all metabolic and cardiovascular parameters should be evaluated and treated aggressively to reach currently recommended clinical targets.

CONCLUSION

Low levels of ejection fraction are significantly correlated with the high levels of serum uric acids. This study also concludes that in diabetic heart failure uric acid is an important prognostic factor.

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