



Research Paper

Relationship between glycemetic control and Left Ventricular Function in normotensive patients with Type 2 Diabetes Mellitus

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Abstract

Objective: In diabetic patients a greater risk of development of heart disease is associated with Poor glycaemic control. The main objective of this study was to evaluate the relationship between glycemetic control and left ventricular function in patients with type 2 diabetes mellitus.

Methods: This was a retrospective observational study in 60 normotensive adults between the ages of 30 and 60 years. 60 non diabetic patients whose demographic profile almost similar to the study group was taken as control group.

Result: There were no marked difference in clinical demographic profile among the diabetic study and control group. It was observed that mean ejection fraction was significantly low with higher HbA1c value. Between the groups left ventricular function assessment has no significant differences as demonstrated.

Conclusion: For diastolic and systolic left ventricular dysfunction HbA1c is an independent risk factor. Between LV function and HbA1c an inverse relationship was demonstrated in this study.

Keywords: Left Ventricular Function, glycemetic control, normotensive Patients

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I. INTRODUCTION:

Diabetic heart disease were increasing rapidly across the globe with rapid intensification of uncontrolled diabetic cases as demonstrated in number of epidemiological, clinical and autopsy studies [1-3]. A complex and multifactorial pathophysiology link between diabetes and cardiovascular disease (CVD) were make the association critical to treat by clinicians [4].

For cardiovascular disease (CVD), uncontrolled diabetes is a prime risk factor. Vascular disorders include coronary artery disease (CAD), stroke, peripheral vascular disease (PVD), nephropathy and retinopathy were also associated with prolong abnormal glycemetic levels [5-7].

Even in the absence of coronary artery disease and hypertension, many studies had reported that the higher incidence of heart failure in diabetic subjects [8]. In asymptomatic patients with Type 1 or Type 2 DM abnormal diastolic function was confirmed by doppler echocardiography studies as an early indicator of cardiac involvement [9].

Furthermore in type 2 diabetes patients, the relationship of LV diastolic filling and uncontrolled glycemetic levels has not been well defined. Additional knowledge on relationship between LV function and the clinical features of diabetes and in the preclinical phase abnormalities of cardiac function will definitely provide a great help in understanding the disease and its prognosis.

In diabetic patients a greater risk of development of heart disease is associated with Poor glycaemic control. The main objective of this study was to evaluate the relationship between glycemetic control and left ventricular function in patients with type 2 diabetes mellitus.

II. MATERIALS AND METHODS:

This was a retrospective observational study in 60 normotensive adults between the ages of 30 and 60 years. 60 non diabetic patients whose demographic profile almost similar to the study group was taken as control group. Entire study was conducted through clinical case reports presented at IGIMS endocrinology OPD department. As per international guideline any patients who were having HbA1c > 7% were considered as uncontrolled type 2 diabetes mellitus [1]. patients.

Any patients who were not willing to participate in this study or doesn't have the proper clinical record as required was excluded from this study. The other exclusion criteria were patients with hypertension (blood pressure > 130/80 mmHg), heart failure with preserved ejection fraction or congestive heart failure, haemoglobinopathies, severe anaemia, chronic pulmonary disease, renal failure, thyroid dysfunction, cardiomyopathy, ischaemic or valvular heart disease.

Pre-designed pro forma was created to collect complete systemic and general examination with detailed clinical history like resting 12 lead conventional ECG reports, 2D ECHO reports, Fasting blood sugar reports, post prandial blood sugar reports, HbA1c reports, serum lipid profile reports.

Statistical significance was defined if $p < 0.05$ and all p values were 2-tailed. SPSS version 24.0 statistical software (SPSS, Inc., Chicago, Illinois) were used to perform all statistical analysis.

III. RESULT:

Table 1 demonstrated no marked difference in clinical demographic profile among the diabetic study and control group. In diabetic study group all patients received glucose lowering therapy and 80% patients are on oral glucose lowering therapy where as 35% patients are on injectable insulin therapy.

Table 1: Demographic detail of study and control group

Parameter	Study group (N =60)	Control group (N- 60)	P value
Age (years)	50 ± 6	51 ± 5	0.5
Sex (male)	31 (52%)	32 (53%)	0.7
Weight (kg)	89 ± 12	84 ± 16	0.6
Body mass index (kg/m ²)	28 ± 4	26 ± 4	0.4
Waist-hip ratio	0.9 ± 0.08	0.7 ± 0.08	0.3
Duration of DM (months)	7 ± 4	NA	NA
Treatment			
Fasting blood sugar (mg/dl)	142.7 ± 17.4	96.8 ± 2.1	0.001
post prandial blood sugar (mg/dl)	240.3 ± 42.7	121.5 ± 4.6	0.001
HbA1c (%)	8.4 ± 1.2	6.4 ± 0.2	0.001
OHD	48 (80%)	NA	NA
Insulin	21 (35%)	NA	NA
Insulin + OHD	8 (13%)	NA	NA
Total cholesterol (mg/dL)	201 ± 35	182 ± 38	0.04
Triglycerides (mg/dL)	210 ± 57	180 ± 29	0.08
LDL (mg/dL)	130 ± 28	120 ± 23	0.03
HDL (mg/dL)	39 ± 10	45 ± 9	0.001

It was observed that mean ejection fraction was significantly low with higher HbA1c value (table 3). Relationship between HbA1C & LV function in type 2 diabetic patients were briefly demonstrated in table 2.

Table 2: Relationship between HbA1C & LV Function in Diabetic Patients

HbA1C	MEAN EF%	MEAN Ve/Va
<7.5	53.64%	0.762
7.5-9	43.14%	0.95
>9	40.16%	0.86

Between the groups left ventricular function assessment has no significant differences as demonstrated in table 3.

Table 3: Correlation between left ventricular function in asymptomatic patients with type 2 diabetes mellitus and control group

Parameter	Study group (N =60)	Control group (N- 60)	P value
Left atrium size (cm)	3.8 ± 0.6	3.6 ± 0.3	0.6
Left atrium volume index (LAVI - ml/m ²)	32 ± 5	28 ± 2	0.5
Deceleration time (ms)	222 ± 69	201 ± 42	0.1
E/e'	11 ± 3	9.8 ± 2	0.2

IV. DISCUSSION:

This retrospective observational analysis confirms the fact that uncontrolled glycemc level is the main culprit of cardiovascular abnormalities irrespective of gender specially in age group of 50 to 60 years. In the uncontrolled diabetic group, high burden of cardiovascular abnormalities was clearly manifested and correlated with a high level of BMI, dyslipidemia and HbA1c.

Patil et al. [2] and Hassan et al. [3]; already documented that prevalence asymptomatic LVDD were high in uncontrolled type 2 diabetes patients. In line with his studies the current research paper also documented high prevalence of lower left ventricular function in uncontrolled diabetic study group as compare to non diabetic control group.

Current study author observed higher HbA1c level (8.4 ± 1.2 %) as compare to nondiabetic control group (6.4 ± 0.2%) and the difference was statistically significant (p=0.001). This observation was also in line with previous study conducted by Kyong et al [4] where among diabetic patients group HbA1c was 7.62 as compared to 5.3 of non diabetic control group. Even in few other studies like our study HbA1c value were high in diabetic group as compare to control group [5,6].

There are few studies which confirms relation to the left ventricular structure and function with early LV diastolic filling defects in diabetes which was also associated with microangiopathy [7-9]. Even in our study mean LVEF 40.16% in patients having HbA1c>9% as compared to patients with HbA1c<7% where LVEF was 53.64%. In patients who were having good glycemc control (HbA1c<7%) Ve/Va was 0.762 and towards mild diastolic dysfunction. In patients who had poor glycemc control (HbA1c>9%) mean Ve/Va was 0.86. This deterioration of left ventricular diastolic and systolic ruction along with inappropriate glycemc control was also observed in few older studies [10,11].

As comparable to HbA1c, E/e' and all other echocardiographic Doppler parameters was a powerful predictor of stroke and cardiovascular abnormalities like myocardial infarction [12]. In our study, we found strong correlation between LVDD and HbA1c levels and obesity which was also in line with few previous studies [13-15].

In a single centre relatively small number of patients and long duration followup was the major limitations of current study. To support our findings future studies with a longitudinal cohort design including a control group with larger patient populations are necessary.

V. CONCLUSION:

For diastolic and systolic left ventricular dysfunction HbA1c is an independent risk factor. Between LV function and HbA1c an inverse relationship was demonstrated in this study. Hence to prevent further cardiovascular complication in type 2 diabetes patients HbA1C could be used as an important predictor along with obesity and dyslipidaemia even in normotensive patients .

Disclosure:

The authors declare that there are no competing interests in relation to this manuscript.

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