

A STUDY OF PREVALENCE OF LEFT VENTRICULAR HYPERTROPHY IN TYPE-2 DIABETES MELLITUS PATIENTS

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ABSTRACT

BACKGROUND

Heart disease accounts for 50 percentages of all deaths among people with diabetes. Risk factor for people with diabetes is increase in BP, high serum cholesterol and obesity. Adult with diabetes historically have a 2 or 3 times higher rate of cardiovascular diseases than without diabetes. This risk increases continuously with rising fasting plasma glucose higher than optimal blood glucose is a leading cause of cardiovascular mortality in most world region.

MATERIALS AND METHODS

Present study is a prospective hospital-based observational study conducted in the Department of General Medicine, Konaseema Institute of Medical Sciences, Amalapuram, between April 2015 to May 2017. A total of 110 patients who has been diagnosed as type-2 diabetes mellitus were selected for this study as per inclusion and exclusion criteria. Electrocardiography of all the patient was done by same machine Philips Page Writer Tc20, 12 leads standard supine ECG was stand recorded. A number of different voltage criteria for LVH has been proposed. We have used Cornell Voltage Criteria for diagnosis of LVH, that is $SV3+RAVL >28$ mm in males and $SV.3+RAVL >20$ mm in females, in these patients were divided into two groups.

RESULTS

There was statistically significant difference between fasting plasma glucose concentration defence in both groups. Group-1 FPG was 131.1 mg/dL, in group-2, it was 108.4 mg/dL with P value 0.0007. PPPG was also higher in group-1 that is 165.1 mg/dL than group-2 that is 138.45 mg/dL. Glycosylated haemoglobin was higher in group-1 than in group-2 that is 6.86 and 6.20 respectively with a P value 0.327, which is not significant statistically. Duration of diabetes was longer in group-1 than group-2. There is statistically significant difference in SBP and DBP in both group.

CONCLUSION

In our study, we have found that prevalence of left ventricular hypertrophy was high in type-2 diabetes mellitus patients. Prevalence is high in patient with longer duration of diabetes mellitus and with higher fasting and postprandial glucose.

KEYWORDS

Left Ventricular Hypertrophy, Diabetes Mellitus, Prevalence.

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BACKGROUND

World Health Organisation recent compiled data shows that approximately 150 million people have diabetes mellitus worldwide, which will be double by the year 2025. It is also predicted that in developing country most of the people will be in the 45-64 yrs. of age, which is the most productive year of life.¹ Heart disease accounts for fifty percentages of all deaths among people with diabetes. Risk factor for people with diabetes is increase in BP, high serum cholesterol and obesity. Adult with diabetes historically have a 2 or 3 times

higher rate of cardiovascular diseases than without diabetes. This risk increases continuously with rising fasting plasma glucose.^{2,3} higher than optimal blood glucose is a leading cause of cardiovascular mortality in most world region.⁴

Left ventricular hypertrophy is an important risk factor for cardiac complication in type-2 diabetes mellitus maybe hyperinsulinaemia and hyperglycaemia in addition to hypertension.⁵

Various pathological changes in addition to hypertension in diabetes mellitus contributes to cardiac hypertrophy like diabetes-related alterations in the expressions of some calcium associated proteins may lead to progressive intracellular decay of calcium and in the development of diabetic cardiomyopathy. Hyperinsulinaemia also impairs phosphatidylinositol 3-kinases pathway and can precipitate myocardial dysfunction. Furthermore, accumulation of reactive oxygen species affects the coronary circulation and causes myocardial hypertrophy and fibrosis in diabetes mellitus patient's heart. There is increased fatty acid metabolism and oxidation, which is considered a

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pathophysiological mechanism in the development of hypertrophy.

Present study is aimed to know the prevalence of Left Ventricular Hypertrophy (LVH) in type-2 diabetes mellitus patient in coastal region of Andhra Pradesh, so that early intervention can prevent it to progress in end-stage heart disease.

MATERIALS AND METHODS

Present study is a prospective hospital-based observational study conducted in the Department of General Medicine, Konaseema Institute of Medical Sciences, Amalapuram, between April 2015 to May 2017.

A total of 110 patients who has been diagnosed as type-2 diabetes mellitus were selected for this study as per inclusion and exclusion criteria. This study is approved by institutional ethics committee. An informed written consent was taken by all the patients before enrolment into this study.

Inclusion Criteria	Exclusion Criteria
Age 40-60 yrs.	Patient with IHD and CHF
Sex both	Thyroid disorder and renal failure
Type-2 diabetes mellitus	Pregnancy and lactation type-1 DM

Patient's particular like age, sex, weight, body mass index, fasting plasma glucose, postprandial plasma glucose, HbA1c and blood pressure was measured.

Parameters	Group-1 with LVH (Mean)	Group-2 with LVH (Mean)	P value	
Number	42	68	-	
Age in years	49.05	49.67	0.404	
Sex	Male	49	-	
	Female	19	-	
BMI (kg/m ²)	27.81	26.29	0.240	
FPG (mg/dL)	131.24	108.4	0.0007	
PPPG (mg/dL)	165.1	138.45	0.0001	
HbA1C	6.86	6.2	0.327	
Duration of diabetes (yrs.)	5	3.51	0.00014	
Hypertension	SBP (mm of Hg)	142.46	134.26	0.0001
	DBP (mm of Hg)	96.64	92.44	0.0001
Duration of hypertension (yrs.)	4.62	2.44	0.001	
Total cholesterol (mg/dL)	240.24	236.4	0.212	
LDL (mg/dL)	146.44	142.40	0.402	
HDL (mg/dL)	39.6	38.2	>0.05	
TG (mg/dL)	168.48	172.8	>0.05	
Clinical Characteristic Parameters of Both Group 1 and 2 (with and without an LVH)				

Out of 42 patients in group-1, 32 were males and 10 were females. Similarly, in group-2, out of 68 patients, 49 were males and 19 were females. There was difference between body mass indexes in both groups. In group-1, it was 27.81 kg/m², and in group-2, 26.29 kg/m² with P value 0.240. There was statistically significant difference between fasting plasma glucose concentration defence in both group. Group-1 FPG was 131.1 mg/dL, in group-2, it was 108.4 mg/dL with P value 0.0007. PPPG was also higher in group-1 that is 165.1 mg/dL than group-2 that is 138.45 mg/dL. Glycosylated haemoglobin was higher in group-1 than in

Electrocardiography of the entire patient included in this study was done. Serum total cholesterol, LDL, HDL and triglyceride was also estimated in all the patients. Hexokinase method was used for estimation of plasma glucose. For total cholesterol, we used Liebermann-Burchard reaction colorimetric method. Triglyceride was estimated by method of Neri and Fringe. HDL concentration was estimated by precipitation method. LDL concentration was calculated by WHO formula. LDL - cholesterol = total cholesterol - TG/5 - HDL (mg/dL). Glycosylated haemoglobin was measured by spectrophotometer.⁶ Electrocardiography of all the patient was done by same machine Philips Page Writer Tc20, 12 leads standard supine ECG was stand recorded. A number of different voltage criteria for LVH has been proposed. We have used Cornell Voltage Criteria for diagnosis of LVH⁷ that is SV3+RAVL >28 mm in male and SV3+RAVL >20 mm in female, in these patients were divided into two groups. Group-1 patients have ECG finding of LVH and group-2 patients have ECG finding without LVH. Statistical analysis done by Student's t-test with P value less than 0.05 were taken as significant.

RESULTS

Of the 110 patients, patient with Left Ventricular Hypertrophy (LVH) was 42, that is in group-1 and patients without left ventricular hypertrophy were 68. Mean age of the patient in group-1 was 49.05 yrs., and in group-2, it is 49.67 yrs.

group-2 that is 6.86 and 6.20 respectively with P value 0.327, which is not significant statistically. Duration of diabetes was longer in group-1 than group-2. There is statistically significant difference in SBP and DBP both group. Mean SBP and DBP was higher in group-1. Duration of hypertension was more in group-1 that is 4.62 yrs. in comparison with group-2 that is 2.44 yrs.

Dyslipidaemia was present in both groups. Total cholesterol was 240.24 mg/dL in group-1 and 236.4 mg/dL in group-2. Serum LDL was 146.44 mg/dL in group-1 and 142.40 mg/dL in group-2. Serum HDL concentration was

39.6 in group-1 and 38.2 mg/dL in group-2. Triglyceride was also towards higher side in both groups that 168.48 mg/dL and 142.8 mg/dL.

DISCUSSION

Present study was aimed to evaluate the prevalence of left ventricular hypertrophy in type 2 diabetes patient. We have found that prevalence of LVH was high that is 38.18%. Similar result was found by M. Jobe et al.⁸ In the study of Jithendra B Somaratne et al, the prevalence of LVH was 56%.⁹ Mean age in both group were same and there was male predominance. Difference in BMI was not significant, but in group-1, BMI was little higher than group-2, which is similar to the work of Sakamol Santra et al¹⁰ and Kauzo Eguchi et al.¹¹ Fast and postprandial plasma glucose was significantly high in group-1. This is similar to the study of Mohan Thanikachalam et al¹² and Besty B. Dokken et al.¹³ Persistent hyperglycaemia and metabolic syndrome is important factor for LVH. Glycosylated haemoglobin was little higher in group-1. LVH patient have longer duration of DM than without LVH, which is similar to the Sato A et al¹⁴ and Sukamal et al.¹⁰ As per the study of A Dawson et al,¹⁵ increase in SBP and DBP along with duration of hypertension is important contributory factor for LVH. This is similar with our finding. Dyslipidaemia was found in both groups. As per the study of Malgorzata et al,¹⁶ dyslipidaemia is important factor for LVH.

CONCLUSION

In our study, we have found that prevalence of left ventricular hypertrophy was high in type 2 diabetes mellitus patients. Prevalence is high in patient with longer duration of diabetes mellitus and with higher fasting and postprandial glucose.

REFERENCES

- [1] WHO. Diabetes mellitus. Fact sheet N 138.
- [2] Global Report on Diabetes. Geneva: World Health Organization 2016.
- [3] Singh GM, Danaei G, Farzadfar F, et al. The age-specific quantitative effects of metabolic risk factors on cardiovascular diseases and diabetes: a pooled analysis. *PLoS One* 2013;8(7):e65174.
- [4] Danaei G, Lawes CM, Vander HS, et al. Global and regional mortality from ischaemic heart disease and stroke attributable to higher-than-optimum blood glucose concentration: comparative risk assessment. *Lancet* 2006;368:(9548):1651-1659.
- [5] Santra S, Basu AK, Roychowdhury P, et al. Comparison of left ventricular mass in normotensive type 2 diabetes mellitus patients with that in the nondiabetic population. *J Cardiovasc Dis Res* 2011;2(1):50-56.
- [6] Friedewald WT, Levy RI, Fredrickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. *Clin Chem* 1972;18(6):499-502.
- [7] Casale PN, Devereux RB, Alonso DR, et al. Improved sex-specific criteria of left ventricular hypertrophy for clinical and computer interpretation of electrocardiograms: validation with autopsy findings. *Circulation* 1987;75(3):565-572.
- [8] Jobe M, Kane A, Jones JC, et al. Electrocardiographic left ventricular hypertrophy among Gambian diabetes mellitus patients. *Ghana Medical Journal* 2015;49(1):19-24.
- [9] Somaratne JB, Whalley GA, Poppe KK, et al. Screening for left ventricular hypertrophy in patients with type 2 diabetes mellitus in the community. *Cardiovascular Diabetology* 2011;10:29.
- [10] Santra S, Basu AK, Roychowdhury P, et al. Comparison of left ventricular mass in normotensive type 2 diabetes mellitus patients with that in the nondiabetic population. *J Cardiovasc Dis Res* 2011;2(1):50-56.
- [11] Eguchi K, Boden-Albala B, Jin Z, et al. Association between diabetes mellitus and left ventricular hypertrophy in a multi-ethnic population. *Am J Cardiol* 2008;101(12):1787-1791.
- [12] Thanikachalam M, Harivanzan V, Sunderarajan J, et al. Hyperglycemia is an independent predictor of left ventricular hypertrophy. *Circulation* 2014;130:A14866.
- [13] Dokken BB. The pathophysiology of cardiovascular disease and diabetes: beyond blood pressure and lipids. *Diabetes Spectrum* 2008;21(3):160-165.
- [14] Sato A, Tarnow L, Nielsen FS, et al. Left ventricular hypertrophy in normoalbuminuric type 2 diabetic patients not taking antihypertensive treatment. *Q J Med* 2005;98(12):879-884.
- [15] Dawson A, Morris AD, Struthers AD. The epidemiology of left ventricular hypertrophy in type 2 diabetes mellitus. *Diabetologia* 2005;48(10):1971-1979.
- [16] Ostrowska M, Bellwon J, Koziński M, et al. Prevalence of electrocardiographic left ventricular hypertrophy among patients with coronary artery disease and diabetes mellitus. *Medical Research Journal* 2016;1(1):1-9.