MEDICAL CHANNEL

Original Article

FREQUENCY OF ASYMPTOMATIC LEFT VENTRICULAR SYSTOLIC DYSFUNCTION IN PATIENTS OF TYPE 2 DIABETES MELLITUS

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ABSTRACT

Objective: To determine the frequency of asymptomatic left ventricular dysfunction (ALVD) in type 2 diabetes mellitus patients.
Material and methods: Study design: Cross sectional study.
Setting: This study was performed at the medical Outdoor Patient's Department (OPD), Chandka Medical College & Hospital (CMCH) Larkana.
Duration of study: Ten months from January 2011 to October 2011.
Subjects and methods: One hundred and thirty eight patients were included who fulfilled the inclusion criteria after taking their verbal and written consent.
Results: 83 (60.1%) males and 55 (39.9%) females. The mean age was 62.7 ± 11.116 years. The mean duration of diabetes was 6.50 ± 4.150 years, and mean ejection fraction was 62.35 ± 5.794%. Out of 138 patients 09 (6.5%) patients had asymptomatic left ventricular systolic dysfunction and 11 (8.0%) patients had left ventricular hypertrophy.
Conclusion: Long axis left ventricular systolic function was decreased in patients with Type 2 diabetes mellitus, and is associated with left ventricular hypertrophy.

Key words: Diabetes mellitus type 2, Echocardiography, Asymptomatic left ventricular systolic dysfunction, Left ventricular hypertrophy.

INTRODUCTION

Diabetes mellitus (DM) is a metabolic syndrome of absolute or relative deficiency of insulin secretion with or without increased peripheral resistance resulting to defects in glucose, fat, and protein metabolism. Type 2 diabetes mellitus accounts 90% of types of diabetes mellitus. Individuals of diabetes type 2 are more prone to develop atherosclerosis, and insulin resistance resulting to heart disease, stroke and peripheral vascular disease.

Prevalence of diabetes mellitus type 2 is increasing worldwide and now has become the global health problem. International Diabetic Federation has predicted that the number of diabetic patients will increase from 240 million in 2007 to 380 million in 2025, with 80% of disease burden over low to middle income countries.[1] Among top ten counties of high diabetic prevalence, six are in Asia and accounts for more than 60% of world's population of diabetes.[2]

Diabetes mellitus (DM) increases with age, in 2005 prevalence of DM in united states was 0.22% at the age below 20 years, 9.6% at 20 to 60 years, and above 60 years prevalence have reached to 20.9%.[2]

Worldwide average prevalence was 4-7% in general population, [3,] but since last two decades prevalence has increased. In rural Bangladesh prevalence has increased from 2.3% to 6.8% between 1999 and 2004.[4] In china (Shanghai) from 1% in 1980 to 5.5%

in 2001 and 10% in Hong Kong and Taiwan.[5] In urban Indian from 3% in early 1970 to 12% 2000, while in rural south India it was 9.2% in 2000 in 2006 reached to 18.6%. Prevalence of DM can be as high as 40% in some Pacific Island populations,[6] while in United States at age >20 years was 13.3% in African Americans, 9.5% in Latinos, 15.1% in Native Americans.[2]

In Pakistan prevalence is >12% in adult of above 25 years of age, about 7 million peoples are having diabetes mellitus,[7] and is estimated that it will reach to 11.5 million by the year 2025, and around 70% of diabetes type 2 patients are dying by some form of cardiovascular disease.

Each year, 3.2 million people around the world (1.7-5.2%) die from complications associated with diabetes; it is the fifth leading cause of death worldwide. It is predicted that diabetes incidence will double by 2025 indicates also parallel rise in cardiovascular-related illness and death, with an inevitable and profound impact on global healthcare systems.

Left ventricular systolic dysfunction (LVSD) is the pumping dysfunction of left ventricle which may range from symptom less to symptoms of heart failure (HF). Cardiovascular disease (CVD) is a major contributor to mortality of diabetic patients of type 2. Both LVSD & HF are prevalent more or less of equal frequency in general population. SOLVED trial show that if LVSD is left untreated it will progress with the rate of 9.7%/year to heart failure.[8]

Asymptomatic left ventricular dysfunction (ALVSD) is usually diagnosed by echocardiography. Patients of asymptomatic left ventricular dysfunction show signs of secondary neurohormonal activation that indicates decreased tissue perfusion. The serum concentration of norepinephrine, renin, antidiuretic hormone, and atrial and brain natriuretic peptides are elevated, reaching the levels intermediate between age-matched controls and patients with symptomatic heart failure, the degree of neurohormonal elevation is predictive of outcome.[9] It is evident from various studies that if treatment is started at asymptomatic stage even then it will reduce the cardiovascular complications.[10]

MATERIAL AND METHODS

Study design and Setting: This Cross sectional study was performed at the Medical Outdoor Department (OPD) Chandka Medical College & Hospital (CMCH), Larkana, over a period of ten months from January to October 200. All those patients who were above 40 years of age and having diabetes mellitus type 2 for more than 5 years of either sex were included. While following patients were excluded from the study, those having typical signs and symptoms of left ventricular dysfunction like dyspnea, orthopnea, basal crepitation. Past history or medical record suggestive of macrovascular disease. Patients having any revascularization procedure in the past (coronary artery bypass surgery or coronary angioplasty).Those with congenital heart disease, pericarditis, myocarditis, cardiomyopathy, or valvular heart disease.

Data Collection procedure:

This study was conducted after taking approval from hospital ethical review committee. The patients who were diabetic and presented in medical OPD of CMCH Larkana were selected (who fulfilled the inclusion criteria) and were enrolled in this study after explanation of the study protocol and taking verbal and written consent.

All patients underwent the complete 2-dimensional echocardiography and Doppler studies in the left lateral decubitus position from multipline windows, using commercially available equipment s(Imagic Sigma 500 D Series- Kontron Medical France M-Mode, 2D Doppler N cw-pw-pulse wave tissue Doppler color Doppler CFM) with a phased array transducer of 2.5 MHz. All images were recorded during two cardiac cycles.

Conventional echocardiography was performed by consultant cardiologist having more than five years experience, including M-mode, 2-dimensional, pulsed and colour Doppler echocardiography. Right and left ventricular diameters, left and right atrium diameters, septal and posterior wall thickness was measured according to the recommendations of the American society of echocardiography, and left ventricular ejection fractions (EF) was calculated, and EF d"55% was deemed as left ventricular systolic dysfunction.

The data was collected on the predesigned Performa by the primary researcher, which included patient's age, gender, and duration of diabetes and echocardiography findings i.e. Left ventricular systolic dysfunction and ejection fraction.

Data Analysis:

The data was analyzed on SPSS version 17.0. The frequency and

TABLE I.
Study Population

Male		Female		Total
No	Percentage	No	Percentage	138
83	60.1	55	39.9	

TABLE II.
Gender distribution

	Gender	Age in years	Duration of diabetes in years	Ejection fraction %
Male Total No. 83	Mean	64.90	8.64	62.90
	Std. Deviation	10.008	2.961	11.008
Female Total No 55	Mean	63.50	9.02	62.27
	Std. Deviation	11.368	3.342	11.689
	p value		0.889	0.026

TABLE III.
Age Group Distribution of Mean

Age Group in years		No; and Percentage of Patients	Mean Duration of Diabetes in years	Mean Ejection Fraction
Group 1	40 to 50	12 (8.7)	6.50 + 0.522	57.50 + 1.784 %
Group 2	51 to 60	62 (44.9)	6.95 + 1.593	65.52 + 5.794 %
Group 3	61 to 70	27 (19.6)	8.04 + 0.759	59.52 + 9.689 %
Group 4	71 to 80	26 (18.8)	12.54 + 1.944	58.38 + 7.267 %
Group 5	More than 80	11 (8.0)	14.64 + 1.748	66.9 + 10.502 %
p value			< 0.05	0.781

TABLE IV.
Gender distribution of Asymptomatic Left Ventricular Dysfunction

Gender with total number	Asymptomatic Left Ventricular Systolic Dysfunction (ALVSD)		Asymptomatic Left Ventricular Hypertrophy (ALVH)	
	Yes	Yes	Yes	No
Male (83)	7 (8.4%)	76 (91.6%)	9 (10.8%)	74 (89.2%)
Female (55)	2 (3.6%)	53 (96.4%)	2 (3.6%)	53 (96.4%)
p value	0.672		0.319	

percentage was calculated for qualitative variable like gender and asymptomatic left ventricular systolic dysfunction. Mean and standard deviation (SD) was computed for quantitative variables like age, duration of diabetes and ejection fraction.

RESULTS:

In our study one hundred and thirty eight (138) patients fulfilled the inclusion criteria were included, among them 83 (60.1%) were male and 55 (39.9%) were female. Table I. Mean ages of male and female were 64.90 + 10. 008 and 63.50 + 10.008 respectively. Table II.

Among age groups mean duration of DM was 6.50 + 0.522 in group 1, 6.95 + 1.593 in age group 2, 8.04 + 0.759 in age group 3, 12.45 + 1.944 in age group 4, and 14.64 + 1.748 in age group 5 Table III. While mean durations of DM in all male and female were 8.64 + 2.961 years and 9.02 + 3.342 years respectively. Table II.

Age group wise mean left ventricular ejection fraction was, 57.50 + 1.784% in age group 1, 65.52 + 5.794% in group 2, 59.52 + 9.689% in group 3, 58.38 + 7.267% in group 4, while in group 5 it was 66.9 + 10.502%. Table IV. Among all male and female had mean ejection fraction of 62.90 + 11.008% and 62.27 + 11.689% respectively. Table II.

Asymptomatic left ventricular systolic dysfunction (ALVSD) was present in 9 patients out of 138 study population (6.521%), and out of 9 patients 7 (77.78%) were male and 2 (22.22%) were female. So among 83 male of study population 7 had ALVSD accounting 8.43%, while two female had ALVSD out of 55 (3.63%). Table IV.

While asymptomatic left ventricular hypertrophy (ALVH) was observed in 11 patients out of 138 (7.97%), out of 11 male were 9 (81.82%) and 2 (18.18%) were females. Hence LVH was present in 9 male out of 83 male and two female out of 55 of study populations, accounting 10.84% and 6.63% respectively. Table IV.

DISCUSSION:

The diabetes mellitus type 2 is a risk factor for cardiovascular disease including congestive heart failure; Kund Lundbaek originally proposed the diabetic specific myocardial disease a "diabetic cardiomyopathy", [11] and decrease in long axis of left ventricular function is an apparent in the early stage of diabetic cardiomyopathy.[12] Loss of long axis left ventricular function has been suggested that it as a precede both coronary heart disease and hypertension.[13]

Diastolic dysfunction has also been claimed to be present early in diabetic myocardial involvement independent of the presence of hypertension in type 2 diabetic patients, and is associated with mortality risk four times that of individuals without heart failure.[14, 15] Chronic hyperglycemia can also contribute to diabetic vascular complications through formation of advanced glycation end products (AGEs), which are irreversibly formed biochemical end products of non enzymatic glycation.[16] Advanced glycation end products are thought to play a key role in the pathogenesis of diabetic cardiomyopathy.

In our study Asymptomatic left ventricular systolic dysfunction (ALVSD) was present in 6.5% of diabetics, and asymptomatic left ventricular hypertrophy was present in 8.0% of study population.

Both asymptomatic systolic and diastolic abnormalities combine were present in 20 patients out of 138 patients accounting 14.49% left ventricular dysfunction. This resembles to the study of Magnusson M et al, [17] where asymptomatic left ventricular systolic dysfunction was observed in 6.1% of diabetic patients. We do not found any local study for comparison.

In various epidemiological studies asymptomatic LVSD was 0.8% in ECHOES study,[18] 33% was observed in 2003 Copenhagen study,[19] 79% in 1999 Poole study[20] and 46% in 2001 Vasteras study.[21]

Prevalence of heart failure in general population is 1 to 4% depending on age,[3,22] and in diabetic patients heart failure rate is 12%, rising to 22% at age >64 years.[3,23] DM is an independent risk factor for heart failure, in Framingham study risk was two-fold in men and five fold in women.[24] In US diabetics study incidence of heart failure was 30.9/1000 person per year in comparison with matched non diabetic (12.4/1000).[25] There are number of independent risk factors for development of heart failure like; HbA1c, increased BMI, increasing age, coronary heart disease, use if insulin, end stage renal disease, nephropathy, retinopathy, duration of diabetes mellitus, hypertension, proteinuria and albuminuria.

CONCLUSION:

Left ventricular systolic dysfunction & left ventricular hypertrophy was prevalent in asymptomatic patients with type 2 diabetes. ECG was an inadequate test to identify ALVSD & ALVH and while echocardiography was superior to ECG. Thus, there remains a need for a screening of asymptomatic left ventricular systolic dysfunction as primary care in patients of diabetes mellitus type 2 to enhance risk stratification and management.

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