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Research Article

EPIDEMIOLOGICAL STUDY OF DILATED CARDIOMYOPATHY FROM EASTERN INDIA WITH SPECIAL REFERENCE TO LEFT ATRIAL SIZE

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ABSTRACT

Background: Dilated cardiomyopathy (DCM) is a common cause of emergency visit in our country. The disease is often misdiagnosed and mistreated. There are very few studies on DCM from India. We undertook a small study on DCM patients from Eastern India to find the demographic and echocardiographic characteristics.

Patients and methods: We undertook this study in a tertiary care Medical College of Eastern India. All patients coming to the emergency with dyspnea were evaluated for cardiac dysfunction. Emergency echocardiography was done to diagnose dilated cardiomyopathy. Patients with DCM were then evaluated as per protocol. After stabilization, echocardiography was repeated to note the study parameters like left atrial diameter. Standard statistical tests were used. **Results:** we had a total of 70 patients in our study with a male: female ratio of 43:27. Most patients were aged over 40 years. Patients with COPD, history of radiation, malignancy or drug abuse were excluded. Most patients (47%) were on NYHA stage 3 at the time of presentation. In our patient cohort, 24% were alcoholic and 46% were smokers. Atrial fibrillation was present in 15.7% of the patients and right and left bundle branch block had been present in 8 and 15 patients respectively. In echocardiography, increased left atrial (LA) size (>40 mm) was found in 45 patients. Many patients had valvular regurgitation, mitral, aortic or tricuspid. LA size was positively correlated with left ventricular systolic diameter ($r=0.403$) and negatively correlated with ejection fraction ($r=-0.23$). **Analysis and conclusion:** different ECG abnormalities like bundle branch block and arrhythmias like atrial fibrillation are quite common in DCM. In echocardiography, left atrial size is an important prognostic marker and correlates with left ventricular function.

Keywords: Dilated cardiomyopathy, left atrial size, LVIDS, male preponderance, NYHA staging

INTRODUCTION

Dilated cardiomyopathy (DCM) is an important cause for emergency room visits in our country. This disease is often misdiagnosed as COPD or asthma and patients often receive wrong treatment for a long time. Exact prevalence of DCM in India is not known. In a study from Europe, the incidence of DCM was found to be 6.95/100 000/year.¹Diabetes,

alcoholism, neurological disorders and congenital cardiac diseases were the main associated comorbidities in DCM patients in this study.¹But in many cases, the cause remained unknown. The patients were also found to have different types of arrhythmia.

Studies regarding DCM are very rare from India. A study on paediatric patients with DCM found a very high incidence of different viral infections like CMV and Coxsackie.² However, similar risk factors for Indian adults are largely unknown. One study evaluated the role of inheritance in Indian DCM patients.³ However, there were no definite conclusions and DCM in India was found to be a heterogeneous disease. Diet, especially pure vegetarian diet with no animal protein, was found to be an important factor in causation of DCM in India.³ DCM is a very common problem in daily practice, but we hardly know the epidemiological features in Indian setting. We, therefore, undertook this small pilot study from Eastern India to characterise the different demographic variables in DCM patients. The Electrocardiographic (ECG) and echocardiographic characteristics of these patients were also studied for any association.

PATIENTS AND METHODS

This was a hospital based cross sectional observational study. Adult patients coming to the emergency of a tertiary care medical college with dyspnea and/or chest pain were evaluated. Emergency chest X ray, Electrocardiography (ECG) and echocardiography were done and a trained cardiologist examined the patients clinically. Those who were found to have dilated cardiomyopathy (DCM) were then evaluated after stabilization. Informed written consent was taken from each study subject or next of kin, also obtained permission of an institutional ethical committee of the medical college. Demographic data like alcoholism history and smoking history were taken from the patient or next of kin. Exclusion criteria: Patients with coexisting COPD (chronic obstructive pulmonary disease), any malignancy, rheumatological disorder, drug abuse, history of radiation to the thorax or those with congenital cardiac diseases were excluded from the study.

ECG (electrocardiography) was done using a standard BPL machine (model number: CMECG-04) at paper speed of 25 mm/second. All ECGs were interpreted by the same person.

Echocardiography was done using a Philips Envisor machine version C.1.3 model number M2540A. All the echocardiographic observations were made by the

same observer to avoid inter-observer variations. Echocardiography was done in emergency to diagnose DCM. But for the chamber dimensions and other study parameters, the test was repeated after the patient was stabilized. Left atrial size was measured as the antero-posterior diameter in parasternal long axis view (PLAX). In the same view, ejection fraction and fractional shortening were also measured. Valvular regurgitation was measured by continuous wave Doppler (CWD) in apical four chamber view as per the European Association of Echocardiography recommendations, 2010.

There were a total of 70 patients in our study. Initially 88 patients were chosen, but some did not consent to the study and some others were found to have one or more of exclusion criteria. The data was entered into Microsoft excel worksheet before analysis. Continuous data is here expressed as mean \pm S.D. and discrete data is expressed as number/percentage. Chi-square test with Yate's correction has been used to calculate p-value (2-tailed) of 2 \times 2 contingency tables. For continuous data, Pearson's correlation coefficient was calculated. For discrete data like NYHA class, Spearman's Rho coefficient was used. To compare means of continuous data, student's T test has been used. P value of less than 0.05 was considered significant.

RESULTS

We had a total of 70 patients in our study. The male: female ratio was 43:27 (table 1). Most of the patients (n=60) were aged over 40 years. 50% of the patients were 60 years or older. As table 1 show, 24% of the patients had a history of regular intake of alcoholic drinks and 46% of the patients were smokers. Of the smoker subset, 15 patients (46.9%) had a smoking history of more than 20 pack-years. The chief presenting complaint of DCM was dyspnea. Majority of the patients were in New York heart association (NYHA) class 3 (figure 1). Palpitation and chest pain were found in minority of study population (n=4 and n=6 respectively).

Table 2 shows the different electrocardiographic (ECG) characteristics of our patients. Tachycardia (heart rate >100/minute) was present in 48 patients. However, rate >120/minute was present in only 8 patients. Atrial fibrillation (figure 2) was found in 11 patients and ectopic beats

were found in 15 patients. Of these 15 patients, 11 had ventricular ectopics. Right bundle branch block (figure 3) was found in 8 (11.4%) patients.

Table 1: Table showing the demographic characteristics of the study subjects (N=70)

Parameter		Number [percentage]
Age in years	<20	2 [2.8]
	20—<40	8 [11.4]
	41—<60	25 [35.7]
	61	35 [50]
Sex	Male	43 [61.4]
	Female	27 [38.6]
Alcohol intake	No	39 [55.7]
	Occasional (1-2 times/week)	4 [5.7]
	Frequent (>2 times/week)	17 [24.3]
Smoking	None	38 [54.3]
	20 pack year	17 [24.3]
	>20 pack year	15 [21.4]

Table 2: Table showing the ECG findings in our study (n=70)

Parameter		Number/ %	
Rate (/minute)	100	22/31.4%	
	101-110	27/38.6%	
	111-120	13/18.6%	
	121-130	7/10%	
	131	1/1.4%	
Rhythm	Regular	44/62.9%	
	Irregular	Ectopics	15/21.4%
		Atrial fibrillation	11/15.7%
Bundle branch block (BBB)	Rt-BBB	8/11.4%	
	Lt BBB	15/21.4%	
Ectopics	Atrial	4/5.7%	
	Ventricular	11/15.7%	

Table 3: Table showing the echocardiographic findings of our study subjects

Parameter		Number (%)
Ejection Fraction	<20%	3 (4.3)
	20-30%	27 (38.6)
	>30—40%	30 (42.9)
	>40—50%	10 (14.3)
	>50%	0
Left atrial size	3 cm	0
	3.1-4 cm	25 (35.7)
	4.1-5 cm	39 (55.7)
	>5 cm	6 (8.6)
LVIDd	6 cm	0
	6.1—7 cm	29 (41.4)
	7.1—8 cm	35 (50)
	>8 cm	6 (8.6)
LVIDs	4 cm	6 (8.6)
	4.1—5 cm	32 (45.7)
	5.1—6 cm	29 (41.4)
	>6 cm	3 (4.3)
Regurgitation	Mitral	11 (15.7)
	Aortic	1 (1.4)
	Combined mitral and aortic	12 (17.1)
	Tricuspid	20 (28.6)

Table 4: showing the age group wise parameters

Parameter	50 years	>50 years	p-value
Gender ratio M:F	17:11	26:16	0.92
Ejection fraction (%)	32± 9.2	33.1± 6.2	0.54
Heart rate	108.1± 16.8	102.7± 12.6	0.12
Atrial fibrillation	3 (10.7%)	8 (19%)	0.50
Left atrial size (mm)	43.4± 4.6	42.6± 4.7	0.46
LVIDs (mm)	50± 7.4	49.5± 5.6	0.76

The p-values show that there was no significant statistical difference between the two age groups.

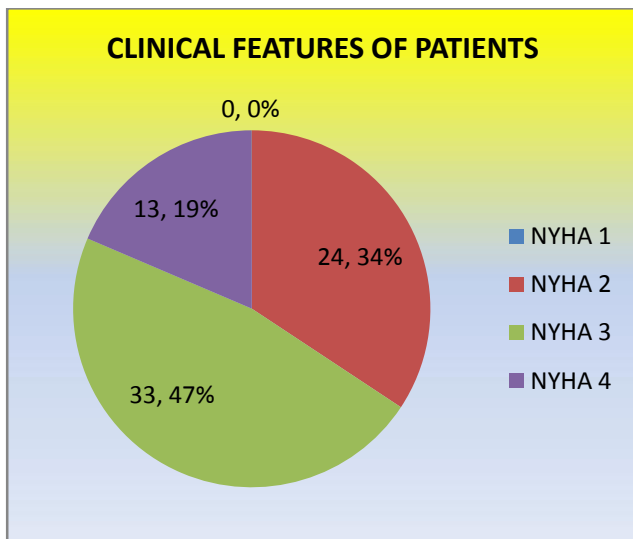


Fig 1: Pie diagram showing the presentation according to NYHA classification.¹³:

NYHA 1:angina, dyspnea, syncope or palpitation (ADSP) at more than usual physical activity
 NYHA2:ADSP at usual/ordinary physical activity
 NYHA3:ADSP at less than usual physical activity
 NYHA 4:ADSP at rest or with minimal activity.
 Bedbound Patients



Fig 2: ECG showing atrial fibrillation



Fig3: ECG showing right bundle branch block (RBBB)

Table 3 shows the echocardiographic characters of the study subjects. It is seen that 57 of the patients had an ejection fraction between 20 and 40%. None of the patients in our study had an ejection fraction above 50%. Left atrial diameter above 4 cm was found in 45 (64.3%) of the patients. Left ventricular systolic and diastolic internal diameters were also elevated in most of the patients. Systolic internal diameter was more than 4 cm in 64 out of the 70 subjects and diastolic diameter was more than 6 cm in all the subjects. Due to the left ventricular enlargement, Valvular regurgitation was quite common. It is seen that combined mitral and aortic

regurgitation was present in 17% of the patients. Tricuspid regurgitation was present in 20 patients. As seen in table 4, there was no significant difference in the parameters based on age. In those aged over 50 years, atrial fibrillation was present in 19% cases. It was seen that left ventricular systolic diameter (LVIDs) was positively correlated with left atrial (LA) size ($r=0.403$; $p=0.0005$). Thus, more the left ventricular systolic dimensions (LVIDs), more the left atrial size.No such positive correlation was found with diastolic dimensions of left ventricle (LVIDD). The ejection fraction was negatively correlated with the left atrial size ($r= -0.2306$; $p=0.055$). Similar relations were found with fractional shortening (FS) of left ventricle ($r=-0.279$; $p=0.019$). The LA size showed a negative correlation with heart rates of the patient ($r= -0.2342$) although this was not statistically significant. LVIDs showed a weak correlation with the presenting NYHA stage of the patient ($r=0.253$, $p<0.05$ by Spearman's rho coefficient).

DISCUSSION

In our study, we found a male preponderance (1.59:1) in our DCM patient cohort. Also, most of the patients were elderly. Similar finding has been reported from U.P., India, where the male: female ratio was 1.5:1 and 48% of the patients were above 60 years of age.⁴In our study, 50% of the patients were 60 years or older. In the aforementioned study, DCM in less than 40 years, females was mainly due to peripartum cardiomyopathy⁴. However, in our study, there were 11 females in the under-40 age group. But only 3 of them (27.3%) had postpartum cardiomyopathy. For the rest, no specific cause was identified. Similar male preponderance in DCM has also been reported from other European studies.^{1, 5}The exact cause for this is not known. But some authors think that the male hormones and lifestyle related changes may predispose to cardiac muscle dysfunction and alteration of cardiomyocyte membrane functions.³However, there are also a few studies where this male predominance has not been found. In one study comparing DCM in blacks and whites in USA, they have found that in the black subset, the male: female ratio was almost equal.⁶ With age, comorbidities like hypertension, diabetes, malignancy or renal failure increase. These may cause DCM and heart failure. In the European study,

in autopsy proven DCM cases, the mean age of patients was 63 ± 13.3 years.¹In our study, the mean age was 54.4 ± 16.2 years.

Alcohol and smoking are two risk factors for different types of heart disease, including DCM. In an Indian study from Hyderabad, smokers and alcoholics comprised almost 18 and 16% of DCM cases respectively.³In our study, 1 in 4 patients were alcoholic. However, it is said that only alcohol is not enough to cause DCM in most cases; alcoholic cardiomyopathy is more common in those with genetic predisposition to heart diseases, in contrast to those without.⁷But we did not do genetic testing in alcoholic DCM cases due to financial reasons. Once DCM develops in alcoholics or smokers, the prognosis is uniformly poor.⁷

Different ECG and echocardiographic findings are found in DCM patients. In one Indian study, they found ST-T changes in 90% cases, Left bundle branch block (LBBB) in 30% and atrial fibrillation in 5% of the cases.⁴In our study, LBBB was found in 21% cases and atrial fibrillation (AF) in 15.7% (table 2). ST-T changes were found in 51% of the cases. Atrial fibrillation and other arrhythmias are potential risk factors for sudden cardiac death in DCM patients. AF may occur spontaneously or may be related to changes in geometry of the heart. In a study from Romania, they found presence of increased LVIDD and mitral regurgitation as risk factors for occurrence of AF.⁸Also, they found that higher the NYHA class, the more the chance of having permanent AF.⁸In our study, 45.5% of patients with AF had mitral regurgitation (MR). Overall prevalence of AF was 15.7%, but among patients with MR, AF was present in 21.7%. Also, as figure 1 shows, overall 46 patients in our study had NYHA class 3 or 4 symptoms (65.7%). But among patients with AF in our study, 72.7% had NYHA 3 or 4 symptoms.

Prominent echocardiographic findings in our study included valvular regurgitation and increased dimensions of left sided chambers (table 3). Especially we found left atrial (LA) diameter >4 cm in 45 patients. Left atrial diameter has important prognostic implications.⁹ It is a good indicator of left ventricular end diastolic pressure.⁹In a study from Kosovo, the authors have found a significant correlation between LVIDD and different left atrial dimensions like diameter, volume and LA area

with different views in heart failure patients.¹⁰ Large LA size is also a risk factor for thrombotic episodes, which may lead to sudden death. Not only cardiac events, but cerebrovascular stroke is also increased in patients with large LA.¹⁰In another study from Turkey, the authors have found significantly increased LA size in those with large LV systolic dimensions in DCM.¹¹This was also linked to increased chance of AF and LA thrombus. Thus, systolic dysfunction in DCM, as evidenced by increased LVIDS, is a risk factor for these comorbidities. LA size may act as a surrogate marker for severity of systolic dysfunction. Appropriate prophylactic therapy may be needed in some cases to prevent potential catastrophe.

In our study, the LV ejection fraction was negatively correlated with LA size of the patients. This correlation between left atrial size and left ventricular function has been found in some other studies too. In one study, the sensitivity of left atrial dimensions in predicting abnormal ejection fraction was found to be 71%.¹² LA size >40 mm was a marker of reduced ejection fraction in that study.^{12,13}

Limitation of the study; our study is limited by the small number of patients. Also, further echocardiographic studies are needed with newer parameters like LA volume, LV mass and tissue Doppler imaging to characterise the cardiomyopathic changes in DCM. We also could not do transesophageal echocardiography in our patients due to logistic reasons. This is a better technique in assessing left atrial abnormalities.

CONCLUSION

This small observational study depicts the high prevalence of DCM in elderly population, especially males. These patients are more likely to have arrhythmia and embolic episodes. Certain echocardiographic parameters like left atrial size were found to correlate with left ventricular parameters and thus may be useful in predicting prognosis in DCM. However, further multicentric studies are needed in order to find the associated features in DCM patients in India and to better elucidate the significance of different chamber dimensions.

Conflict of interest: None

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