ELECTROCARDIOGRAPHIC PROFILE OF DILATED CARDIOMYOPATHY IN PATIENTS ATTENDING A TERTIARY CARE HOSPITAL OF WESTERN NEPAL

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ABSTRACT

INTRODUCTION

Cardiomyopathy is a disease of the heart muscle that leads to deterioration of myocardial functioning. It has different morphological variation with dilated cardiomyopathy being the most common form comprising over 90% of all cases. Heart failure (HF) is the most common clinical presentation of dilated cardiomyopathy. Various electrocardiographic changes are common in these patients. The most common cause of sudden death in these patients is arrhythmia. This study aimed at characterizing different electrocardiographic changes in patients of dilated cardiomyopathy admitted for heart failure.

MATERIAL AND METHODS

A retrospective analysis of records of admitted patients from 1st January 2015 to 30th April 2018 was conducted. Study was conducted after obtaining ethical clearance from institutional review board. Data was collected in a preformed proforma and analyzed using SPSS 20.0 version.

RESULTS

Consecutive 400 cases of dilated cardiomyopathy with systolic dysfunction (LVEF<40%) were taken for the study. Two hundred and fifty two (63%) were male. The mean age of patients was 59.33 (±15.76) years. The most common risk factors in our patients were smoking (66%) followed by systemic hypertension (49%), IHD (32%), and diabetes mellitus (33%) respectively. Out of 400 patients, abnormal ECG were found in 82.5%. The most common abnormality was LVH (30.7%) followed by LBBB (22.5%) and AF (20.5%).

CONCLUSION

The percentage of abnormal electrocardiographic findings was high in our study. All patients of dilated cardiomyopathy should undergo electrocardiography screening for risk stratification and to prevent serious consequences with early necessary intervention.

KEYWORDS Arrhythmia, dilated cardiomyopathy, ECG changes, heart failure

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INTRODUCTION

Cardiomyopathy is a disease of the heart muscle that leads to deterioration of myocardial functioning [1]. According to the World Health Organization (WHO) and American Heart Association (AHA), cardiomyopathy is categorized as dilated cardio-myopathy (DCM), hypertrophic cardiomyopathy (HCM), restrictive cardiomyopathy (RCM), obliterative cardiomyopathy (OCM) and arrhythmogenic right ventricular cardiomyopathy (ARVC) [2, 3]. DCM is the most common form comprising over 90% of all cases causing sudden cardiac death [4]. DCM is considered to be an important cause of heart failure and accounts for up to 25% of all cases of CHF [5].

Heart failure (HF) is an increasingly costly and deadly manifestation of a series of cardiac diseases and constitutes a major public health problem worldwide [6, 7].

Despite current state-of-the-art treatment of HF, mortality rate remains high, and around 5060% of HF patients will die within five years of diagnosis [6]. HF is also associated with increased morbidity as it is characterized by frequent hospital admissions and prolonged hospital stay [8]. Chronic heart failure is a complex clinical syndrome that can result from a number of functional or structural cardiac disorders, impairing the ventricle's ability to fill with or eject blood [9]. Electrical conduction abnormalities are common in heart failure and lead to cardiac arrhythmias and sudden cardiac death [10].

Patients with DCM present a wide variety of electro cardiographic manifestations including bundle-branch block or conduction disturbances, low or high QRS amplitude, abnormal Q-waves, and ST-T wave changes. None of these are specific to, nor diagnostic for DCM. It may be that the variety of electrocardiographic abnormalities reflects the severity of myocardial damage and could be a predictor of the prognosis of patients with DCM.
Currently, there is paucity of data on dilated cardiomyopathy in Nepal. With rising prevalence of chronic heart failure in the country and the availability of echocardiogram (Echo), the incidence of dilated cardiomyopathy is also showing a rising trend. This study aimed at characterizing different electrocardiographic changes in patients of dilated cardiomyopathy admitted for heart failure.

MATERIAL AND METHODS

A retrospective study design was used to conduct the present study. A retrospective analysis of records among patients admitted with diagnosis of dilated cardiomyopathy with systolic dysfunction (LVEF<40%). A sample size of 400 was taken from the hospital record from 1st January 2015 to 30th April 2018. The data was collected as per the attached proforma. Collected data were entered into a master chart prepared in Microsoft Excel 2007 which is checked, verified and converted into SPSS 20.0 version for statistical analysis. Descriptive statistics like mean, percentage, frequency, standard deviation was used to describe ECG changes in patients of systolic heart disease.

Patients admitted for first time during study period with diagnosis of dilated cardiomyopathy with systolic heart failure (LVEF <40%) were enrolled. All eligible subjects agreed to participate in the study. Patient who are not willing to participate were excluded from the study.
Study was conducted after obtaining ethical clearance from institutional review board.

Electrocardiography

Standard 12-lead ECGs were recorded at 25 mm/s and 10 mm/mv. For each lead, R wave and S wave voltages were measured from the PR segment to the top of the R wave and the bottom of the S wave, respectively. Sokolow's criterion (S wave in lead V] [SV1] + R wave in lead V5 or V6 [RV5 or RV6] > 35 mm 7) for LV hypertrophy [11].

Echocardiography

According to the recommendations of the American Society of Echocardiography, LV internal dimension (LVID), intraventricular septum (IVS), and posterior wall thickness (PWT) were measured peak of the R wave on the ECG. LV internal dimension was used as an index of LV dilatation, and wall thickness of IVS and PWT, were used as indices of LV hypertrophy [12].

RESULTS

A retrospective analysis of records among patients admitted with dilated cardiomyopathy and systolic dysfunction (LVEF<40%) from 1st January 2015 to 30th April 2018 with a sample size of 400 was taken.

Table 1. Socio-demographic characteristics of the patients (n = 400)

Age group (yrs)	Frequency (f)	Percentage (%)
≤ 30	32	8
31- 60	160	38
> 60	208	54
Mean ± SD	57.36 ± 13.77	
Gender		
Male	252	61
Female	148	39

More than half (52%) of the patients were in age group > 60 years with mean age of patient was 57.36 (±13.77) years. Out

of 400 patients enrolled 244 (61%) were males and 156 (39%) were females (Table 1).

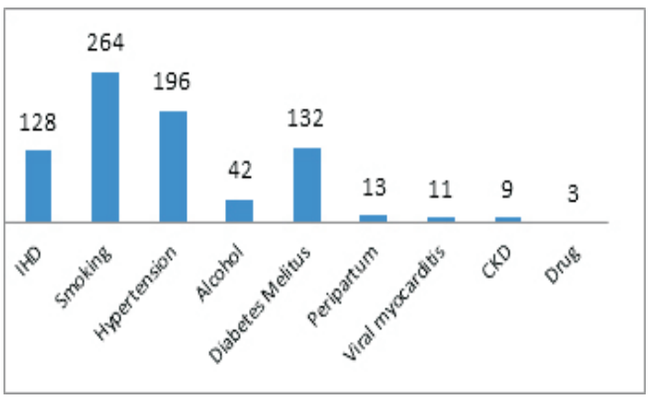

Figure 1. Risk factors associated for dilated cardiomyopathy

The most common risk factor in patients was smoking (66%) followed by systemic hypertension (49%), IHD (32%), and diabetes mellitus (33%) (Figure 1).

Table 2. ECG changes in patients with DCM (n = 400)

Characteristics	Frequency (f)	Percentage (%)
Abnormal ECG	349	87.25
LVH	123	30.75
Sinus Tachycardia	79	19.1
Left axis deviation	53	13.25
Nonspecific ST/T changes	76	19
Q Wave Anterior	29	7.25
Inferior	13	3.25
Arrhythmia in DCM patients		
AF	94	23.5
Atrial premature complex	58	14.5
VPCs in isolation	69	17.25
Ventricular bigeminy	16	4
24 hour holter recording		
Supra ventricular tachycardia	9	2.25
Non-sustained VT	12	3
Sustained VT	7	1.75
Conduction abnormality in DCM patients		
LBBB	102	25.5
RBBB	34	8.5
Non-specific IVCD	66	17.5
A-V block		
3rd	2	0.5
2nd type I	7	1.75
2nd type II	3	0.75
1st	23	5.75

The study notified that 87.25% of patients had abnormal ECG. The most common abnormality was LVH (30.75%) followed by LBBB (25.5%) and AF (23.5%) (Table 2).

Table 3. Echocardiographic findings of the patients (n = 400)

Characteristics	Frequency	Percentage (%)
LA Size		
<4	135	33.75
4-5.5	259	64.75
>5.5	6	1.5
LVEF (%)		
20-25	27	6.75
26-30	79	19.75
31-35	134	33.5
36-40	160	40
MR	338	84.5
Mild	139	34.75
Moderate	168	42
Severe	31	7.75
TR		
Mild	73	18.25
Moderate	124	31
Severe	49	12.25
LVDD		
Grade I	227	56.75
Grade II	151	37.75
Grade III	23	5.75
Pulmonary hypertension	285	71.25
Mild	232	58
Moderate	79	19.75
Severe	17	4.25
Regional wall hypokinesia	90	22.5
Mid and apical septal	65	16.25
Antero-lateral	11	2.75
Inferior	9	2.25
Anterior and inferior	5	1.25
Global wall hypokinesia	308	77
Pericardial effusion	177	44.25
Small	136	34
Medium	33	8.25
Large	8	2
Intracardiac Thrombus	9	2.25

Table 3 shows mitral regurgitation (84.5%), LVDD grade II (37.75%), tricuspid regurgitation (61.5%) and Ejection fraction of 31 to 35% in 33.5%.

Table 4. Echocardiographic findings of the patients (n = 400)

Characteristics	Minimum	Maximum	Mean	Std. deviation
LA Size(mm)	36	57.7	38.1	10.3
LVEDd (mm)	56.2	85.7	62.3	7.2
LVESd (mm)	38	69	50.5	6.7
EPSS(mm)	7.3	37.6	20.9	5.3
FS (%)	9	21	16.74	2.3
LVEF (%)	20	40	34.9	4.7
TAPSE(mm)	7	25	16.3	3.7

Echocardiographic study showed mean LA 38.1(±10.3) mm, LVIDd 62.3 (± 7.2) mm, LVIDs 51(± 6.7), LVEF 34.9 (± 4.7) %, EPSS 21(± 5.1) mm, fractional shortening (16.74 ± 2.2) %, TAPSE16.3 (± 3.7) mm (**Table 4**).

Table 5. Etiology of dilated cardiomyopathy (n = 400)

Etiology	Frequency	Percentage (%)
Ischemic	132	33
Idiopathic	128	32
Alcohol induced	42	10.5
HTN	196	49
Peripartum cardiomyopathy	13	3.25
Viral Myocarditis	11	2.75
Valvular heart disease	8	2
CKD	9	2.25
Drug	4	1

The most common cause of dilated cardiomyopathy was ischemic heart disease (33%) followed by idiopathic (32%), Alcohol induced and systemic hypertension in 10.5% each (Table 5).

DISCUSSION

The current study observed the various electrocardiographic and echocardiographic changes among the patients with dilated cardiomyopathy in 400 patients. The present study showed the most common risk factors in our patients were smoking (66%) followed by systemic hypertension (49%), IHD (32%), and diabetes mellitus (33%) analogous with study by Anh L. Bui [13]. The ECG finding in the patients with dilated cardiomyopathy revealed the most common abnormality was LVH (30.75%) followed by LBBB (25.5%), AF (23.5%) and RBBB (8.5%). Similar results were obtained in a study from eastern India showing 21.4% LBBB and 11.4% RBBB[14]. Sonowal et al showed analogous result with LVH (41.94%), atrial fibrillation (22.58%) and bundle branch block (29%) [15]. Another comparable findings were noted by Patil et al. with LBBB (24%), RBBB (4.6%) and AF (9.23%) [16] whereas a study conducted in Vadodara, India revealed sinus tachycardia (53%) as a predominant finding followed by LVH (13.33%) and RBBB (13.16%) [17] respectively. A study in Kenya showed dissimilar result showing LVH (8.8%), LBBB (30.6%), AF (31.5%). [18]

Conduction abnormalities were found in 60.25% of cases which included 1st (5.75%), 2nd (2.5%) and 3rd (0.5%) degree A-V block, LBBB, LAFB, non- specific IVCD and RBBB which is lower than the study by Roberts WC [19] and Wilensky RL [20] where conduction abnormalities occurred in over 80% of cases. Patil et al noted lower rate of conduction abnormalities (47.65%) where 1st, 2nd and 3rd degree heart block were found in 3.07%, 1.53% and 1.53% respectively[16]. The present study showed non-sustained ventricular tachycardia (VT) in 12 (3%) cases and sustained VT in seven (1.75%) cases in 24 hour-holter recording. These findings are strong predictors of future cardiac events as shown in the study by Zareba W [21] and Ponikowski P [22].

Abnormal Q waves (10.5%) and ST-T segment abnormalities (19%), which are more commonly observed in CAD, are also seen in patients with DCM [23, 19]. Berbard G confirmed that patient with dilated cardiomyopathy had pathological Q wave (5.6%) and ST segment abnormalities (34.3%) [17]. Patil et al. revealed the ST depression (18.46%) and QS pattern (16.92%) [16]. Johnson et al. reported that abnormal Q waves were seen in 70% of patients with CAD and LV dysfunction and in I0% of patients with DCM, and that ST-T segment abnormalities were present in both groups of patients [23].

Echocardiographic study showed mean LA 38.1 (± 10.3) mm, LVIDd 62.3 (± 7.2) mm, LVIDs 50.5 (± 6.7), LVEF 34.9 (± 4.7)%, EPSS 20.9 (± 5.1) mm, fractional shortening (16.74 ± 2.3)%, TAPSE16.3 (± 3.7) mm which is similar to study by Ali M et al [24] and Echeverria HH et al [25]. The mean LV ejection fraction in a study conducted in Bareilly was 30.87% which is in line with the present study (34%) [26]. Another comparable findings were acquired by Banerjee SK et al where LVEF was 28(±8) % [27]. Echocardiography findings of the study showed that mitral regurgitation (84.5%), LVDD grade II (37.75%), tricuspid regurgitation (61.5%), ejection fraction of 31 to 35% is 33.5% which is similar to the study conducted by Saxena et al. with mitral regurgitation (73.3%), LVDD grade II (33.3%) ejection fraction of 31 to 39% in 35% [26]. Another identical finding was accomplished by Rana et al. with ejection fraction of 31 to 35% in 26%, tricuspid regurgitation (63.3%), mitral regurgitation (48.66%) [17]. The most common cause of dilated cardiomyopathy was ischemic heart disease (33%). Other common causes were idiopathic (32%), alcohol induced and systemic hypertension in 10.5% each, peripartum cardiomyopathy and viral myocarditis in 4.5% each, valvular and CKD in 2% each, drug (1%). Kasper EK et al found that 46.6% cases idiopathic, other common specific cardiomyopathies included ischemic 11%, HIV related 4.9%, peripartum 4.9% alcoholic 3.4%, hypertensive 2.1% and valvular 1.5% [28]. A study conducted in north east India documented that main cause of cardiomyopathy is idiopathic (41.93%), alcohol (22.58%) and peripartum (22.58%) [15].

The current study has few limitations. The assessment of the ECGs with inter-individual variability during the placement of chest leads may have occurred. Another limitation lies in the echocardiographic measurements where technical errors may have occurred in the measurements of wall thickness and LV internal dimension. The retrospective nature of this study is also a limitation.

CONCLUSION:

The percentage of abnormal electrocardiographic findings was high in our study with some changes that have serious consequences. All patients of dilated cardiomyopathy should

undergo electrocardiography screening for risk stratification and to prevent serious consequences with early necessary intervention.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

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