

Cardiac disease pattern amongst patients presenting to the echocardiography unit in a rural teaching hospital- A cross sectional study

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Abstract

Background- Cardiac disease is the second most common non-communicable disease in Nepal but we do not yet have data for the upper Karnali region. This paper assesses the prevalence of various types of cardiac diseases in the sole tertiary level hospital serving the upper Karnali region.

Methods- This is a single center, descriptive, cross-sectional study of one year duration from July 2019 to August 2020 involving a total of 284 patients who underwent echocardiography in karnali academy of health sciences. Data on patient variable such as age, sex and diagnosis were obtained from hospital medical records.

Results- Out of a total of 284 patients, Cor-pulmonale was seen in 90 (31.6%) patients, Diastolic dysfunction in 52(18.3%) patients, Valvular heart disease in 21(7.3%) patients, Cardiomyopathy in 11 (3.8%) patients, Myocardial infarction in 9(3.1%) patients and congenital heart disease in 7(2.4%) patients.

Conclusions- Cor-pulmonale and diastolic dysfunction were the top two common cardiac disease in our study area. Community based study of cardiac disease and screening of rheumatic heart disease is recommended due to its low prevalence in our study area.

Key words- Cardiac diseases, Echocardiography, Cor-pulmonale, Diastolic dysfunction, Rheumatic heart disease

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INTRODUCTION

Cardiac disease is the second most common non-communicable disease in Nepal¹ with one study showing the prevalence to be 5.7%.² It is also a common problem amongst patients presenting in this hospital according to unpublished data. The spectrum of cardiac disease nationally may not be the same as regionally. There is not a single study on cardiac disease pattern for the upper Karnali region as of the writing of this paper. This makes it difficult to plan and implement future health programs like screening camps, training programs, surgical camps.

Echocardiography is a useful non-invasive tool in the diagnosis of cardiac disease.³ The rural teaching hospital at upper Karnali has been equipped with an echocardiography machine since 2019. The objective of this study was to find out the pattern of cardiac disease among patients who presented to Karnali Academy of Health Sciences (KAHS).

MATERIAL AND METHODS

This was a single center, descriptive, cross-sectional study. The sample size of this study was 284 individual patients using the slovin's formula for 95% confidence interval. This formula was used due to the lack of data about the study area. No total population data for study area was obtained from the official government website which gives census data of 2011. After reviewing various national and international literatures, a proforma was developed which comprised demographic, clinical and echocardiographic features. It was further discussed with the subject experts and finalized.

Cor-pulmonale in our study was defined as alteration in structure and function of the right ventricle resulting from diseases affecting the function and/or structure of the lung.⁵ Diastolic dysfunction in our study was defined as a condition meeting all the following three criteria- 1. clinical presentation of heart failure, 2. normal or near normal ejection fraction, and 3. evidence of impaired left ventricular relaxation- in our study echocardiographic finding of $E/A < 1$ was used due to unavailability of invasive cardiac catheterization.⁶

Dilated cardiomyopathy in our study was defined as the presence of left ventricular dilatation and left ventricular systolic dysfunction in the absence of abnormal loading conditions (hypertension and valve disease).⁷ Hypertrophic cardiomyopathy in our study was defined as a disease state characterized by unexplained left ventricular (LV) hypertrophy associated with non-dilated ventricular chambers in the absence of another cardiac or systemic disease that itself would be capable of producing the magnitude of hypertrophy evident in a given patient.⁸ Rheumatic heart disease in our study was defined as valvular heart disease meeting definite or probable diagnostic criteria for rheumatic heart disease.⁹ Myocardial infarction in our study was defined as showing imaging evidence of loss of myocardium contractibility in a pattern consistent with ischemic etiology.¹⁰

The inclusion criteria was patients of all ages who had undergone echocardiography in our institution and whose data had been recorded. Data were retrieved from medical records of echocardiography unit dating from July 2019 to

August 2020 retrospectively. After checking for completeness of data, 284 patients who met the inclusion criteria were enrolled in the study. Trans-thoracic 2-dimensional non-contrast echocardiography with color flow and spectral doppler technique was used in this study.

Echocardiography was done using the Sonoscape s30 model which has the standard features of 2d, color flow and spectral doppler imaging with a transducer frequency range of 1-16 MHz. Echocardiography was performed by the primary author who is a internal medicine specialist registered with the Nepal Medical Council and has been doing echocardiography for the last four and a half years. Data entry and analysis was done using MS excel program. Frequency and percentage were calculated. Ethical clearance was obtained from the institutional review committee of KAHS Ref: 077/078/01.

RESULTS

Adequate data record of 284 patients was available of which 165 (58.1%) were female and 119 (41.9%) were male (Figure 1). Patients from all 5 districts of the upper Karnali region were seen with Jumla having the highest number 252(88.7%) followed by Kalikot-16(5.6%), Mugu-7(2.4%), Humla-1(0.3%), Dolpa-1(0.3%), districts other than upper Karnali-7(2.4%) (Figure 2).

There was a high prevalence of Cor-pulmonale-90(31.6%) followed by diastolic dysfunction-52(18.3%), valvular heart disease-21(7.3%), cardiomyopathy-11(3.8%), myocardial infarction-9(3.1%), congenital heart disease-7(2.4%) (Figure 3). There was a total of 52 cases of diastolic dysfunction out of which 3(5.7%) were younger than 45years of age (Figure 4). There was a total of 11 cardiomyopathy out of which 1(9%) was hypertrophic cardiomyopathy and 10(90.9%) was dilated cardiomyopathy (Figure 5). There was a total of 7 cases of congenital heart disease out of which 5(71.4%) was atrial septal defect and 2(28.5%) was ventricular septal defect (Figure 6).

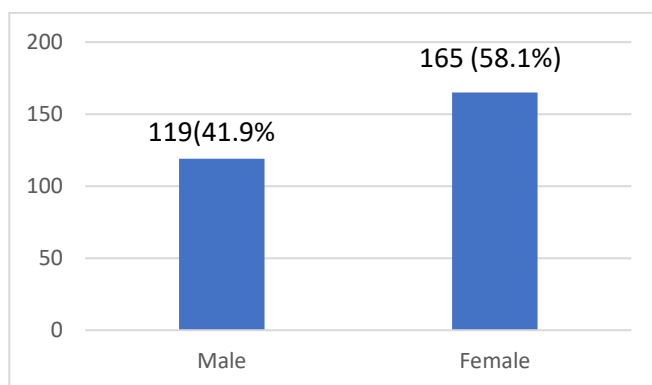


Figure 1. Sex wise distribution of cardiac disease

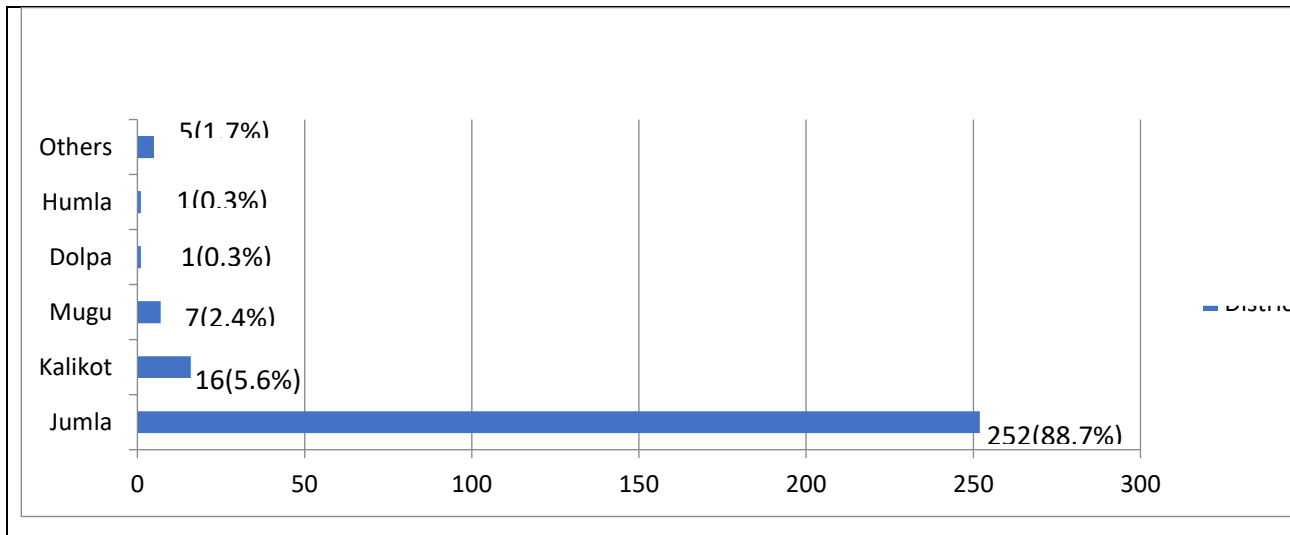


Figure 2: District wise distribution of the patients

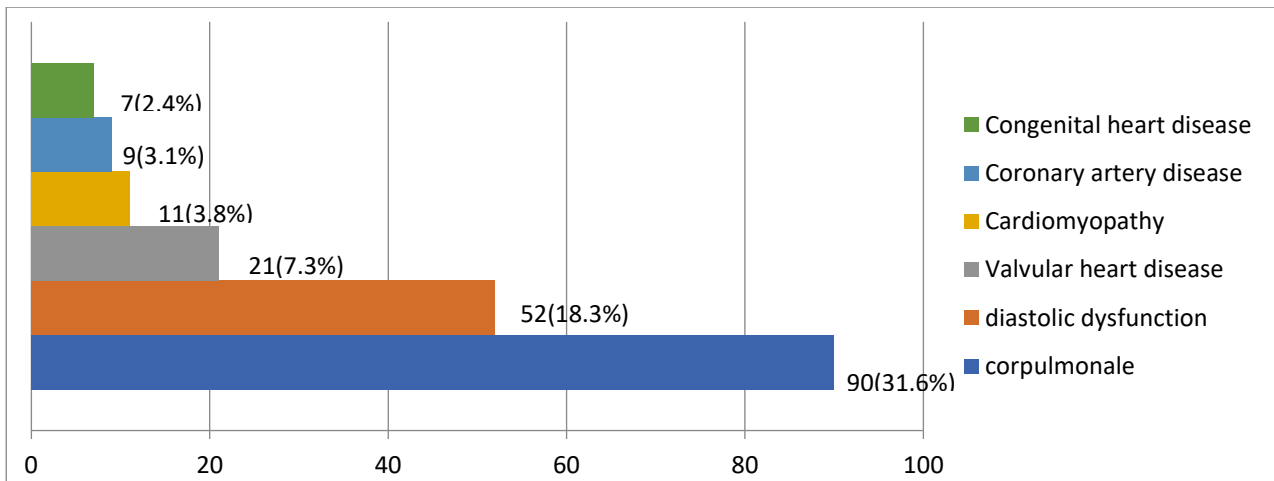


Figure 3: Prevalence of cardiac diseases amongst patients

Table 1: Type of cardiac disease amongst patients

SN	Diagnosis	Total	Male	Female	Subtype
1	Normal	94(33%)	72(77%)	22(23%)	
2	Cor pulmonale	90(31.6%)	34(37%)	66(63%)	
3	Diastolic dysfunction	52(18.3%)	18(35%)	34(65%)	
4	Valvular heart disease	21(7.3%)			Rheumatic heart disease-20(7%) Degenerative-1(0.3%)
5	Cardiomyopathy	11(3.8%)	8(73%)	3(23%)	Dilated cardiomyopathy-10(3.5%) Hypertrophic cardiomyopathy-1(0.3%)
6	Myocardial infarction	9(3.1%)	4(44%)	5(56%)	
7	Congenital	7(2.4%)	4(67%)	2(33%)	Atrial septal defect-5(1.7%) Ventricular septal defect-2(0.7%)

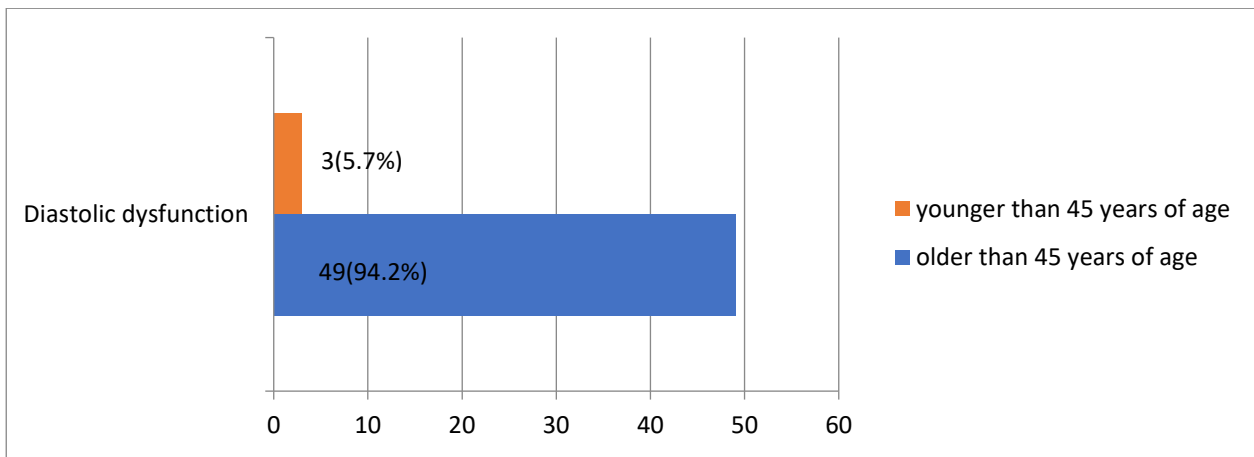


Figure 4: Age wise distribution of diastolic dysfunction

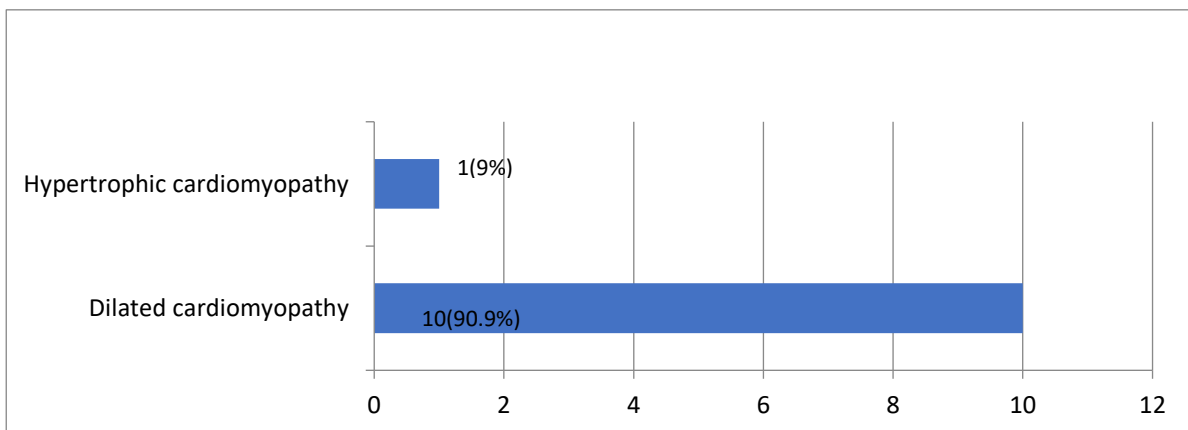


Figure 5: Types of Cardiomyopathies

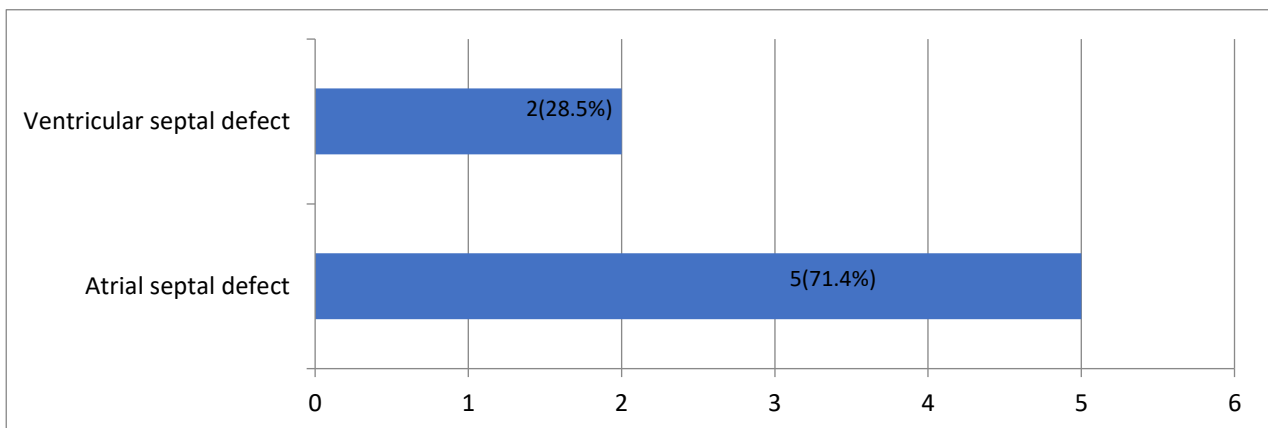


Figure 6- Types of congenital heart disease

DISCUSSION

The most common cardiac disease in our study was cor pulmonale (31.6%), which was identified by the typical echocardiographic findings of dilated right atrium and right ventricle and tricuspid regurgitation.¹¹ The reason behind high prevalence

of cor pulmonale can be explained by the poor adoption of oxygen concentrators by respiratory hypoxic patients to provide domiciliary oxygen. Oxygen in the form of cylinders were also lacking due to unavailability of oxygen refilling center and poor road conditions in our study area.

Only 2(2.2%) patients of cor pulmonale were below 40 years of age which is similar to another study.¹² Both of those patients had atrial septal defect. The rest were above 40 years of age with hypoxia secondary to chronic respiratory disease like chronic obstructive pulmonary disease and fibrotic lung disease. Forty years was chosen as a cut-off point since below this age, chronic obstructive pulmonary disease is unlikely¹³ as prolonged hypoxia leads to pulmonary hypertension and cor pulmonale.¹⁴ 3 (3.3%) patients were in 40's age group. This was likely due to fibrotic lung disease since as stated above COPD is unlikely in patients below 40 years of age and long-term progression of pulmonary hypertension in chronic obstructive pulmonary disease is slow.¹⁵

Diastolic dysfunction (18.3%) was the second most common finding. It has been predicted that in the next decade or so, it will become the most prevalent form of heart failure.⁵ This was identified with the traditional parameters of trans-mitral flow, that is the measurement of E/A ratio in the presence of normal ejection fraction.^{16,17} Most patients (94.2%) were above the age of 45 with only 3 (5.7%) patients below 45 which is consistent with a similar study.¹⁸ Myocardial ischemia has been associated with diastolic dysfunction¹⁹ but can be missed due to unavailability of angiography and exercise electrocardiography. Diastolic dysfunction is sometimes difficult to identify by traditional doppler echocardiography, for instance, in tachycardia near fusion of E and A waves lead to it being difficult to identify and compare.²⁹ Recent guidelines have called for invasive determination of diastolic dysfunction which is unavailable and impractical in most institutions including ours.⁶ other advanced modalities like tissue doppler

imaging was not available in this institution. Post exercise echocardiography which could unmask diastolic dysfunction was not a part of our routine echocardiography protocol so not used.

Cardiomyopathies accounted for only a few cases (3.8%) with the predominant type being dilated cardiomyopathy. This finding is similar to another study done.²⁰ Dilated cardiomyopathy was diagnosed based on guidelines of the British Society of echocardiography⁷ and cardiac measurements were compared to the Asian²¹ and Nepalese population.²² There was a rare diagnosis of peri-partum cardiomyopathy, a type of dilated cardiomyopathy in one of the patients.²³ Similarly, there was only one case of hypertrophic cardiomyopathy diagnosed on the basis of family history and echocardiographic finding.

There were total of 9 (3.1%) cases of myocardial infarction diagnosed on the basis of history, resting electrocardiography study and regional wall motion abnormality in echocardiography. This finding is similar to the finding of a national survey of non-communicable disease in Nepal.¹ Such cases could be underdiagnosed since traditional echocardiography does not reliably differentiate ischemic versus non-ischemic cardiomyopathy²⁴ as angiography facility was not available in our institution.

Valvular heart disease (7.3%) was also a common finding in our study. The predominant valvular involvement was mitral regurgitation which was similar to another study.²⁵ The most common etiology was rheumatic heart disease in this study based on the finding of mitral stenosis and

eccentric nature of the regurgitation. The most common cause of mitral stenosis is rheumatic heart disease.²⁶ Eccentric nature of mitral regurgitant jet has been attributed to rheumatic heart disease and less commonly papillary muscle and/or chordal dysfunction.²⁷ Aortic regurgitation due to rheumatic heart disease was the next most common valvular disease. There was only one case of aortic regurgitation possibly being secondary to atherosclerotic degeneration due to its single valve involvement and age of the patient.²⁸ A similar study published in 2001 at Gangalal hospital with nearly the same sample size showed a much higher prevalence of rheumatic heart disease (27.3% versus 7.5% in our current study).⁴ This paper has shown some deviation from another key study done in the national heart center in which rheumatic heart disease was the most common cardiac problem.⁴ This could be a result of lack of

rheumatic heart disease screening programs and geographic factors like low population density.

Limitations of this study: Diastolic dysfunction is sometimes difficult to identify by traditional Doppler echocardiography.²⁹ Angiography was not available in our institution which is needed to differentiate dilated cardiomyopathy from ischemic cardiomyopathy when there is triple vessel involvement which can be taken as a limitation of this study.

CONCLUSION

Corpulmonale and diastolic dysfunction were the top two common cardiac disease in our study area. Low prevalence of Rheumatic heart disease suggests either a drop in its incidence or inadequate screening campaigns in the study area. Community based study of cardiac disease and screening of rheumatic heart disease is recommended.

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