

## Original Research Article

# The Spectrum of Echocardiographic Abnormalities Among Referral Patients in A Tertiary Cardiac Hospital in Bangladesh

### ABSTRACT

**Background:** Echocardiography is a non-invasive cardiac examination that provides structural and functional information regarding cardiovascular diseases. It is useful in diagnosis as well as in follow-up of patients with cardiovascular diseases. The advent of echocardiography has already revolutionized the diagnosis of cardiovascular disease cases and made up for the decline in clinical skills. **Aim of the study:** This study aimed to assess the spectrum of echocardiographic abnormalities among referral patients in a tertiary care hospital in Bangladesh. **Methods:** This was a prospective observational study that was conducted in the Department of Cardiology, Ibrahim Cardiac Hospital & Research Institute, Dhaka, Bangladesh from July 2021 to June 2022. In total 221 referred patients to the mentioned hospital who underwent echocardiographic assessment were enrolled in this study as the study population. From all the participants proper consent was taken. Echocardiographic evaluation was performed with Vivid E95 Cardiac Ultrasound system GE. After collecting all data regarding clinical indications, age, sex, and final echocardiographic diagnosis, analyzed and disseminated by using MS Excel and SPSS version 23.0 program as per necessity. **Results:** In this study, in analyzing the echocardiographic findings among participants we observed that, the mean ejection fraction (%), interventricular septum thickness (mm) and systolic pulmonary artery pressure (mmHg) of the participants were  $56.48 \pm 11.37$ ,  $12.03 \pm 1.28$  and  $21.47 \pm 3.49$  respectively. In the majority of the cases (56%), LV diastolic dysfunction, in about half of the cases (44%), mitral valve insufficiency, in more than one-third of cases (36%), aortic valve insufficiency, in 24% of the cases tricuspid valve insufficiency were observed. Besides, aortic valve stenosis (7%), mitral valve stenosis (4%), pericardial effusion (10%), valvular vegetation (1%), and left ventricular thrombus were found in some cases. **Conclusion:** Left ventricular diastolic dysfunction, mitral valve insufficiency, and aortic valve insufficiency may be considered the most frequent echocardiographic abnormalities among referral patients in tertiary care hospitals in Bangladesh.

**Keywords:** Echocardiographic abnormalities, Left ventricular Ejection fraction, Diastolic dysfunction.

### INTRODUCTION

Cardiovascular diseases (CVDs) are the leading cause of death, Worldwide, [1]. About 1.2 million people worldwide died from CVDs in 2015 [2]. Unlike CHDs, which have relatively similar distribution all over the world, RHD resulting from damage to the heart valves caused by one/more episodes of rheumatic fever is naturally preventable and also considered as another important contributor to mortality as well as morbidity in low-middle income countries [3]. Moreover, RHD remains a devastating impact on the health system and is associated with approximately 300,000 deaths globally and the loss of >10 million disability-adjusted life years [4]. Traditionally, thorough physical examination or a comprehensive history have been the mainstay of diagnosis of cardiovascular disease but recent technological advancement has provided some additional methods to optimize patient care. [5] One of these technological tools is echocardiography which is a very effective and relatively cheap noninvasive tool in cardiology. [6] The morphological as well as hemodynamic parameters usually provide guides for the management of such patients. [7] While the sensitivity, as well as the specificity of clinical examination, varies depending on the cardiovascular disease being evaluated, echocardiography is considered to have a high degree of sensitivity and specificity. [7] Generally, it is assumed that, to perform echocardiography, an examiner must be well trained as well as certified, however, for less complex cases, it may not be necessary. [8] Besides all of these, we can mention that intra-operator variability has been well documented to be low in a study which was conducted in a center in Nigeria [9] suggesting it is also a reliable cardiac investigative tool. This current observational study aimed to assess the spectrum of echocardiographic abnormalities among referral patients in a tertiary care hospital in Bangladesh.

### METHODOLOGY

This prospective observational study was conducted in the Department of Cardiology, Ibrahim Cardiac Hospital & Research Institute, Dhaka, Bangladesh during the period from June 2021 to July 2022. In total 221 referred patients to the mentioned hospital who underwent echocardiographic assessment were enrolled in this study as study subjects. Properly written consent was taken from all the participants before data collection. Echocardiographic evaluation was performed with Vivid E95 Cardiac Ultrasound system GE. The whole intervention was conducted following the principles of human

research specified in the Helsinki Declaration, the whole intervention was conducted in [10] and executed in compliance with currently applicable regulations and the provisions of the General Data Protection Regulation (GDPR) [11]. Patient data regarding age, gender, disease duration, history of cardiovascular risk factors and comorbidities, and the treating clinician's interpretation of the echocardiographic examination results concerning the therapy strategy were recorded. All echocardiographic data were collected, processed analyzed and disseminated by using MS Office and SPSS version 23.0.

## RESULTS

In this study, among the total of 221 participants, 62% were male whereas the rest 38% were female. So male participants were dominant in number and the male-female ratio was 1.6:1. The mean age of the participants was  $49.73 \pm 13.48$  years and the mean body weight was  $62.44 \pm 7.58$  Kg. In analyzing the risk factors of CVD among participants we observed that in 37% of cases, the risk factor was hypertension (HTN) and in 33% of cases it was diabetes mellitus (DM); both were noticeable. Besides these, as risk factors, current smoking as well as dyslipidemia was found among 24% and 21% of cases respectively. In this study, for one-third of the participants (33%), hypertension was found as the indication of treatment and diagnosis which was the most frequent indication. Moreover, in 15%, 14% and 12% cases the indications were abnormal electrocardiogram, routine examination and chest pain respectively which was noticeable. Besides these, in some cases, pre-participation sports evaluation, cardiac murmur, valvular heart disease, anxiety disorder, sickle cell anemia, thyroid abnormalities and ischemic heart disease were the indications. In this study, in analyzing the echocardiographic findings among participants we observed that, the mean  $\pm$ SD ejection fraction (%), interventricular septum thickness (mm) and systolic pulmonary artery pressure (mmHg) of the participants were  $56.48 \pm 11.37$ ,  $12.03 \pm 1.28$  and  $21.47 \pm 3.49$  respectively. In the majority of the cases (56%), LV diastolic dysfunction, in about half of the cases (44%), mitral valve insufficiency, in more than one-third of cases (36%), aortic valve insufficiency, in 24% of the cases tricuspid valve insufficiency were observed. Besides, aortic valve stenosis (7%), mitral valve stenosis (4%), pericardial effusion (10%), valvular vegetation (1%), and left ventricular thrombus were found in some cases.

**Table 1:** General characteristics of patients. (N=221)

Characteristics	Frequency (n)	Percentage (%)	Mean $\pm$ SD
<b>Demographic Status</b>			
Male	137	62%	
Female	84	38%	
Age in the year (Mean $\pm$ SD)			$49.73 \pm 13.48$
Body weight in Kg (Mean $\pm$ SD)			$62.44 \pm 7.58$
<b>Risk Factors (CVD)</b>			
HTN	82	37%	
DM	73	33%	
Current smoking	54	24%	
Dyslipidemia	47	21%	

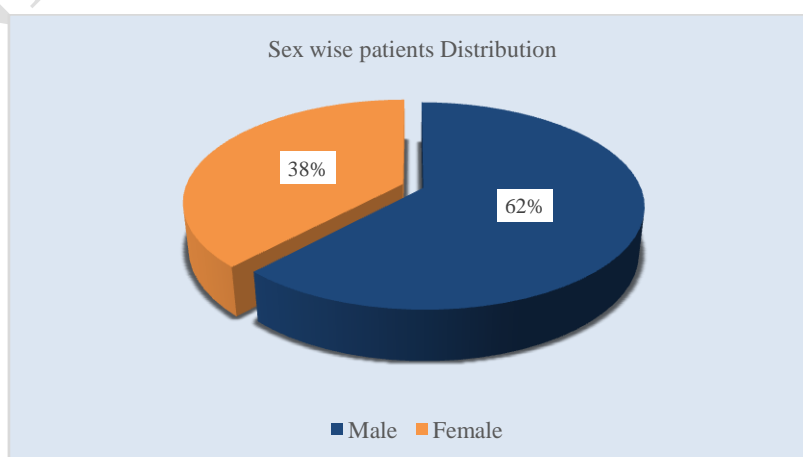


Figure I: Pie chart showed sex-wise patient distribution. (N=221)

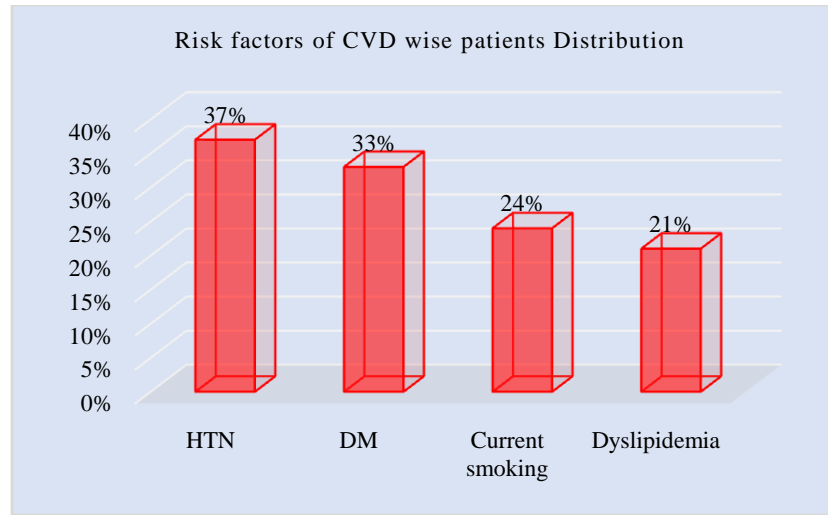


Figure II: Bar chart showed the risk factors of CVD of the participants. (N=221)

Table 2: Distribution of treatment and diagnostic indication of patients. (N=221)

Symptoms	Frequency (n)	Percentage (%)
Hypertension	72	33%
Abnormal electrocardiogram	34	15%
Routine examination	30	14%
Chest pain	27	12%
Pre-participation sports evaluation	13	6%
Cardiac murmur	9	4%
Valvular heart disease	7	3%
Anxiety disorder	6	3%
Sickle cell anemia	5	2%
Thyroid abnormalities	3	1%
Ischemic heart disease	2	1%

Table 3: Echocardiographic findings among patients. (N=221)

Echocardiographic findings	Frequency (%)	Percentage (%)	Mean $\pm$ SD
Ejection fraction (%)			56.48 $\pm$ 11.37
Interventricular septum thickness (mm)			12.03 $\pm$ 1.28
LV diastolic dysfunction	123	56.0%	
Mitral valve insufficiency	97	44.0%	
Aortic valve insufficiency	79	36.0%	
Tricuspid valve insufficiency	52	24.0%	
Aortic valve stenosis	16	7.0%	
Mitral valve stenosis	8	4.0%	
Systolic pulmonary artery pressure (mmHg)			21.47 $\pm$ 3.49

Pericardial effusion	21	10.0%	
Valvular vegetation	2	1.0%	
Left ventricular thrombus	1	0.0%	

## DISCUSSION

This study aimed to assess the spectrum of echocardiographic abnormalities among referral patients in a tertiary care hospital in Bangladesh. In this study in the majority of the cases (56%) LV diastolic dysfunction, in about half of the cases (44%) mitral valve insufficiency, in more than one-third of cases (36%) aortic valve insufficiency was found as the echocardiographic findings which were noticeable. Besides these aortic valve stenosis, mitral valve stenosis, tricuspid valve insufficiency, valvular vegetation, left ventricular thrombus and pericardial effusion were observed. In an echocardiographic study, Ogah et al. [12] determined HHD (Hypertensive heart disease) in 56.7% of the patients. In another study, Raphael et al. [13] found that normal echocardiographic findings were detected among only 44% of the patients and the most common comorbidities were HHD (Hypertensive heart disease) in 41%, VHD in 18%, coronary artery disease in 18% and peripartum cardiomyopathy in 7% in adults, while CHDs in children in 34%. Despite the decreased rate in the incidence of RHD over the last few decades, it remains one of the leading health problems, especially in lower-middle-income countries [14]. In a study, on patients with structural and functional valve abnormalities, 24% of the cases had a valvular abnormality, with the most frequent abnormality being mitral valve insufficiency in 59% and approximately 36% of the patients were diagnosed with RHD [15]. Moreover, the relationship between severe cases of VHD and mortality has been demonstrated [16,17] regardless of the causes. Worldwide, the prevalence of CHDs is relatively similar ranging from 4 to 85 per 1000 births [18,19]. Although VSD is found generally as the most common CHDs, studies with a higher frequency of ASD have also been reported [20,21]. Besides all of these, in this study, among the total of 221 participants, 62% were male whereas the rest 38% were female. So male participants were dominant in number and the male-female ratio was 1.6:1. The mean age of the participants was 49.73 ±13.48 years and the mean body weight was 62.44 ±7.58 Kg. In analyzing the risk factors of CVD among participants we observed that in 37% of cases, the risk factor was hypertension (HTN) and in 33% of cases it was diabetes mellitus (DM); both were noticeable. All these findings may be helpful in the management of cardiovascular patients.

### Limitation of the study:

This was a single-centered study with small-sized samples. Moreover, the study was conducted in a very short period. That's why, the findings of this study may not reflect the exact scenario of the whole country.

## CONCLUSION & RECOMMENDATION

Left ventricular diastolic dysfunction, mitral valve insufficiency, and aortic valve insufficiency may be considered the most frequent echocardiographic abnormalities among referral patients in tertiary care hospitals in Bangladesh. In considering our experiences with the findings of this study we can conclude that echocardiography is an effective diagnostic method in the management of cardiovascular diseases patients.

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