Original Article

Spectrum of heart diseases on Echocardiography in a Rural tertiary care Medical college hospital in Bangladesh.

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Abstract:

Background: *Echocardiography is a non-invasive, on-injurious, relatively cheap and useful imaging technique for the evaluation of cardiac diseases. The procedure has reliable levels of accuracy. Echocardiography commenced at the Cardiology Department of Khawja Yunus Ali Medical College Hospital,Enayetpur Sirajgonj,Bangladesh since 2004.The aim of this study is to report our experience with the procedure, and to define the clinical cases seen in our setting.*

Methods: *This is a retrospective analysis of a prospectively collected data. Echocardiography was performed using Aloka Prosound-SSD 5500 SV echocardiograph equipped with 2.5-5.0 MHz transducer.*

Results: *During the period of 6 months under review (July 2011-December 2011), 1883 procedures were performed. Those reports were reviewed for demographic parameter, indications for the procedure and the main echocardiographic diagnoses. The mean age of the 1883 individuals studied was 50 +/- 18.67 years (10-90). There were 1221 men and 662 women. Four hundred ninety eight(498) (26.45%) had Ischemic Heart Disease, 229(12.16%) subjects were Hypertensive Heart disease,160 subjects (8.5%) had rheumatic heart disease while 62,(3.3%) had cardiomyopathy. Pericardial diseases, corpulmonale, congenital heart diseases, were present in 36(1.92%), 35 (1.85%), 88(4.67%), respectively. Seven hundred and Seventy Five (41.1%) subjects had normal study.*

Conclusion: *Ischemic heart disease was found to be the most prevalent cardiac condition in this study. The relatively frequent diagnoses of Hypertensive heart Disease, valvular heart disease, cardiomyopathies and pericardial diseases reflect the impact of infections on the cardiovascular health of adult Bangladeshis. We suggest that prevention and treatment of cardiac diseases in our setting should among other things focus on life style modification,Ceasation of smoking,regular exercise, blood pressure and blood glucose control and early treatment of infections causing heart diseases.*

Background

Epidemiological studies have shown that heart diseases are on the increase worldwide especially in low income countries and developing economies where non-communicable diseases are emerging[1]. Cardiovascular disease now constitute major health problem in developing nations. Over 80% of global morbidity and mortality from cardiovascular diseases now occur in these countries. Now a days, Heart disease are increasing as alarming pattern in our country. Knowledge of the prevalent and patterns of heart diseases

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in any environment is important in health care planning and in the provision of health care services. Echocardiography has grown to become the most widely used cardiac imaging technique worldwide. In 2003, the medical world marked the 50th anniversary of the original demonstration of cardiac ultrasound by Edler and Hertz. Although the procedure had an unheralded beginning, it has become a powerful tool in the diagnosis of cardiac diseases and in epidemiological studies. In 2003, it was estimated that over 20 million procedures were performed in the United States of America alone[2]. The aim of this study is to report on our experience with the procedure, and to describe the different clinical cases diagnosed with this tool over a period of 6-months.

Methods

This is retrospective and descriptive study of a prospectively collected data. The study was carried out at the Department of Cardiology, of Khawja Yunus Ali Medical College Hospital,Enayetpur Sirajgonj,Bangladesh,The centre is a relatively young tertiary one, established in2004. Echocardiography is performed at our centre on a daily basis. Ethical approval was obtained from our institution's ethical review committee.

Clinical Evaluation:

Baseline clinical and demographic characteristics were obtained from the subjects. These included: date of birth, age, gender and indication for echocardiogram.

Echocardiography

Two-dimensional guided M-mode echocardiography with the use of commercially available echo-machine Aloka Prosound-SSD 5500 SV and a 2.5-5.0 MHz linear array transducer was performed on each subject in the partial decubitus position. All measurements were made according to the American Society of Echocardiography (ASE) leading edge to leading edge convention[3]. Echocardiographic examination was performed in the parasternal long axis, short axis, apical four chamber and occasionally in the subcostal and suprasternal views. LV measurement was obtained at end diastole and end systole in the parasternal long axis view. The LV measurements taken include right ventricular outflow tract diameter (RVOT), aortic root diameter (AO), and aortic valve opening (AVO) and left atrial diameter (LA). Others include interventricular septal thickness at end-diastole (IVSTd) and end-systole (IVSTs), the posterior wall thickness at end diastole (PWTd) and end-systole (PWTs), and the LV internal dimensions at end systole (LVIDs) and end diastole (LVIDd). The end of diastole was taken as the peak of the R-wave of the ECG tracing on the echocardiograph while the end-systolic measurements were taken at the nadir of the LV septal wall[3]. Experienced cardiologist performed all the echocardiography. In our laboratory, the intra-observer concordance correlation coefficient and measurement error have been reported[4]. All the echocardiographic diagnoses were based on standard criteria.

Hypertensive heart disease was diagnosed in the presence of any or combination of the following abnormalities: left ventricular diastolic dysfunction (e.g altered E:A ratio), left ventricular hypertrophy (indexed LV mass > 51 g/ $m^2.7$), and dilated left atrium, a surrogate of impaired LV filling (left atrial diameter > 3.8 cm in women and > 4.2 cm in men). Left ventricular geometric patterns were defined according to Ganau[5].

Ischemic Heart Diseases were documented by detection of RWMA on different region of Heart (such as loss systolic thickening,hypokinesia ,akinesia dyskinesia) and associated with LV systolic dysfunction

Valvular heart diseases (mostly rheumatic in origin) were documented based on the following:

i. *Mitral stenosis:* Presence of thickened and calcified mitral valve leaflets, loss of the classic M-shaped pattern of a normal mitral valve, diastolic dooming and restriction of the mitral valve leaflet motions.

ii. *Mitral Regurgitation:* Poor coaptation of the mitral valve leaflets in systole, thickened leaflets, dilated and hyperdynamic left ventricle,dilated LA.

iii. A*ortic stenosis:* Presence of calcified aortic valve, reduction in aortic cusp separation, highly echo reflectant aortic valve leaflets

iv. *Aortic regurgitation:* Poor coaptation of the aortic cusps in diastole dilated left ventricles and fine fluttering of the anterior mitral valve in diastole.

Dilated cardiomyopathy was diagnosed when there are dilated heart chambers with normal or decreased wall chambers as well as impaired LV systolic function[6].

Endomyocardial fibrosis (EMF) was documented in the presence of clinical features coupled with dilated atria and thickening of the endocardium especially at the apices of the ventricles[6].

Pericardial effusion was diagnosed when there is echo free space between the visceral and parietal pericardium. Corpulmonale was present when there is dilated and hypertrophied right ventricle (RV), evidence of increased RV systolic pressure D-shaped LV in diastole (diastolic flattening
of the LV septum)

Data Analysis :

Data management and analysis were performed with SPSS software version 17.0. Continuous variables were expressed as mean ± SD (standard deviation) and categorical variables expressed as percentages.

Results:

During the 6 months period One thousand, eight hundred and eighty three (1883) subjects were analyzed. Table 1 shows the clinical and demographic characteristics of the subjects. There were 1221 men and 662 women aged 52.4 ± 17.1 and 48.4 ± 18.3 years respectively.

Table 1 :

Parameter	All	Men	Women
Number	1883	1221	662
Age	50± 18.67	52.4 ± 17.1	48.4 ± 18.3
Weight(kg)	66.9(±14.3)	70.0(±15.9)	62.8(±28.3)
Height(cm)	156.1(9.2)	161.8(±68.7)	152.3(±55.2)
Pulse (beat/min)	85.2(±14.4)	84.4(±13.3)	86.0(±15.4)
Systolic BP(mmHg)	130.6(±25.3)	132.7(24.6)	128.6(±26.0)
Diastolic BP(mmHg)	82.0(15.6)	84.0(±16.4)	80.0(±14.6)

The mean age of all the subjects was 50± 18.67 years and range 10-90 years. Table 2 shows the indications for referral for echocardiography.About 27.13% were because of Ischemic heart disease. Other reasons for referral include Hypertension 13.6%,congestive heart failure (3.9%),valvular heart disease (5.52%),cor-pulmonale (1.85%), stroke/ TIA (3.56%) and pericardial disease (1.92%),congenital heart disease(5.95%),pre operative cardiac evaluation (6.59%),pre chemotherapy (4.7%),patients complaints palpitation, Unexplained Dyspnoea, Unexplained leg swelling, (4.40%), (1.70%), (1.10%) respectively; on investigations abnormal ECG (4.7%),cardiomegaly on CXR (3.9%).

Four hundred ninety eight(498) (26.45%) had Ischemic Heart Disease, 229(12.16%) subjects were Hypertensive Heart disease,160 subjects (8.5%) had rheumatic heart disease while 62,(3.3%) had cardiomyopathy. Pericardial diseases, corpulmonale, congenital heart diseases, were present in 36(1.92%), 35 (1.85%), 88(4.67%), respectively. Seven hundred and Seventy Five (41.1%) subjects had normal study.(Table:3)

Among Ischemic heart diseases, more common are Myocardial infarctions than Myocardial hypokinesia.in Myocardial infarction is more common in male populations. Anterior MI was more common (77 cases) and which is male predominant.(Table:4)

Table 2: Indications for Echocardiography in the 1883 subjects.

SNO	Indication	Frequency	Percent (%)
1	Abnormal ECG	89	4.7%
2	Cardiac murmur	48	2.5%
3	Ischemic Heart Disease	511	27.13%
4	Hypertension	256	13.6%
5	Congenital Heart Disease	112	5.95%
6	Cor-pulmonale/Pulmonary Hypertension,COPD	35	1.85%
7	Congestive Heart Failure	74	3.9%
8	Cardiomegaly on CXR	6	0.3%
9	Myocarditis	13	0.69%
10	Palpitation	83	4.40%
11	Pericardial Diseases	36	1.92%
12	Pre-chemotherapy	89	4.7%
13	Pre-operative cardiac evaluation	124	6.59%
14	Restrictive Heart Disease	06	0.3%
15	Routine medical check-up	56	2.98%
16	Stroke/TIA	67	3.56%
17	Diabetic Heart Disease	54	2.86%
18	Thyroid Heart Disease	45	2.38%
19	Unexplained Dyspnoea	32	1.70%
20	Unexplained leg swelling	21	1.10%
21	Valvular Heart Disease	104	5.52%
22	Not specified	22	1.16%
	Total	**1883**	**100%**

The commonest type of valvular heart disease was pure rheumatic mitral stenosis (69 cases) in which females are predominant. This is followed by pure aortic stenosis (23 cases), and 14 cases are pure MR, 14 cases of MS with MR &9 cases of AR, 8 cases of AS with AR. Ten cases of primary mitral valve prolapse were documented

The commonest form of pericardial disease was effusive constrictive pericarditis (13 cases) followed by effusive type (8 cases) and constrictive pericarditis (4 cases).

Ischemic dilated cardiomyopathy was the commonest form of cardiomyopathy (constituting 43 of the 62 cases seen).Among the adult congenital heart disease (88 cases) VSD was more common (29 cases).

Table 3: Echocardiographic Diagnoses in the 1883 subjects:

	All (n = 1883)		Males(n = 1221)		Females (n = 662)	
Diagnosis	**Frequency**	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Hypertensive Heart Disease	**229**	**12.16%**	**152**	**12.45%**	**77**	11.64%
Normal Study	**775**	**41.1%**	**437**	**35.8%**	**338**	51.05%
Valvular Heart Disease	**160**	**8.5%**	**84**	**6.8%**	**76**	**11.48%**
• **Rheumatic MS**	69	-	23	-	46	-
• **Rheumatic MR**	14	-	8	-	6	-
• **MS & MR**	14	-	7	-	7	-
• **AS**	23	-	16	-	7	-
• **AR**	9	-	8	-	1	-
• **AS & AR**	8	-	7	-	1	-
• **MVP**	10	-	7	-	3	-
• **MIXED /Complex**	13	-	8	-	5	-
Ischaemic Heart Disease	**498**	**26.45%**	**412**	**33.7%**	**86**	12.99%
• **Myocardial hypokinesia**	225	-	178	-	47	-
• **MI**	273	-	234		39	-
Cardiomyopathy	**62**	**3.3%**	**41**	**3.35%**	**21**	3.17%
• **IDCM**	43	-	31	-	12	-
• **Idiopathic DCM**	11	-	05	-	06	-
• **HOCM**	04	-	03	-	01	-
• **Rstrictive**	04	-	02	-	02	-
Pericardial Diseases	**36**	**1.92%**	**24**	**1.96%**	**12**	1.82%
• **Effusive**	23	-	15		08	-
• **Effusive-constrictive**	03	-	02	-	01	-
• **Constrictive**	10	-	07	-	03	-
Cor-pulmonale	**35**	**1.85%**	**25**	**2.04%**	**10**	1.5%
• **COPD**	30	-	23	-	07	-
• **Primary Pulmonary Hypertension**	05	-	02	-	03	-
Congenital Heart Disease	**88**	**4.67%**	**46**	**3.7%**	**42**	6.35%
• **ASD**	23	-	08	-	15	-
• **VSD**	29	-	18	-	11	-
• **PDA**	09	-	02	-	07	-
• **COA**	04	-	03	-	01	-
• **TOF**	14	-	10	-	04	-
Complex congenital heart disease	09	-	05	-	04	-

Table:4 .Pattern on Ischemic Heart disease:

IHD	ALL(n=498)		Males(n=412)		Females(n=86)	
	Frequency	(%)	Frequency	(%)	Frequency	(%)
Myocardial Hypokinesia	225	45.18 %	178	43.2%	47	54.6%
Myocardial Infarction	273	54.8 %	234	56.8%	39	45.3%
• *Anterior*	77	-	69	-	08	-
• *Anteroseptal*	52	-	46	-	06	-
• *Inferior*	55	-	46	-	09	-
• *Extensive Anterior*	10	-	07	-	03	-
• *Posterior*	02	-	02	-	00	-
• *Inferior and posterior*	57	-	49	-	08	-
• *Anterior and Inferior*	20	-	15	-	05	-

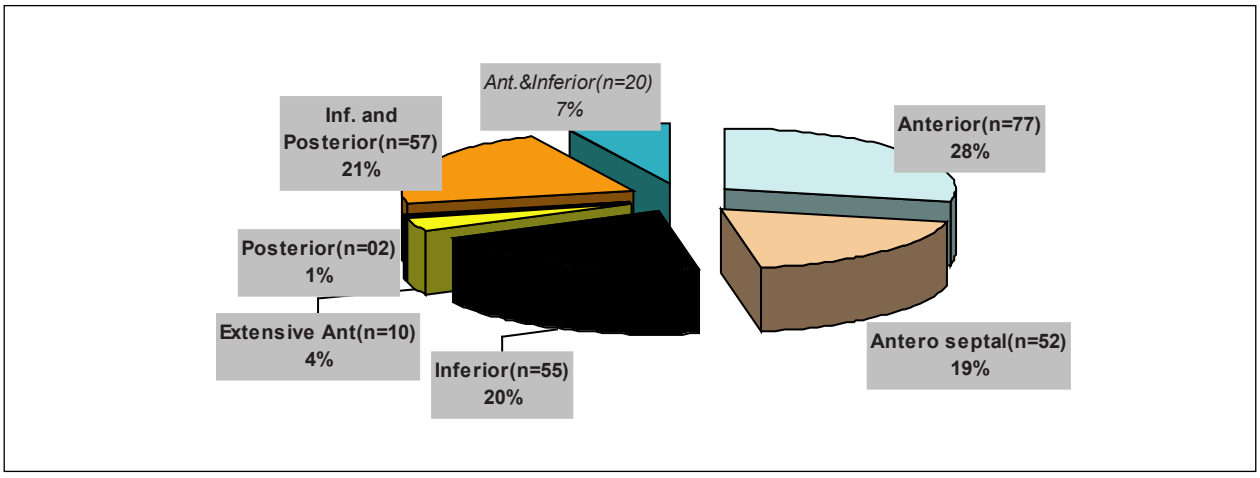

Fig:2 Spectrum of Myocardial infarction according to location of Heart.

Table 5: Spectrum of echocardiographic diagnosed heart diseases (excluding individuals with normal study)

	All (1108)		Males		Females	
Diagnosis	**Frequency**	**(%)**	**Frequency**	**(%)**	**Frequency**	**(%)**
Ischaemic Heart Disease	**498**	**44.95%**	**412**	**52.5%**	**86**	**26.5%**
Hypertensive Heart Disease	**229**	**20.67%**	**152**	**19.3%**	**77**	**23.7%**
Valvular Heart Disease	**160**	**14.45%**	**84**	**10.7%**	**76**	**23.4%**
Cardiomyopathy	**62**	**5.6%**	**41**	**5.2%**	**21**	**6.4%**
Congenital Heart Disease	**88**	**7.95%**	**46**	**5.8%**	**42**	**12.9%**
Pericardial Diseases	**36**	**3.2%**	**24**	**3.06%**	**12**	**3.7%**
Cor-pulmonale	**35**	**3.1%**	**25**	**3.18%**	**10**	**3.08%**
Total	**1108**		**784**		**324**	

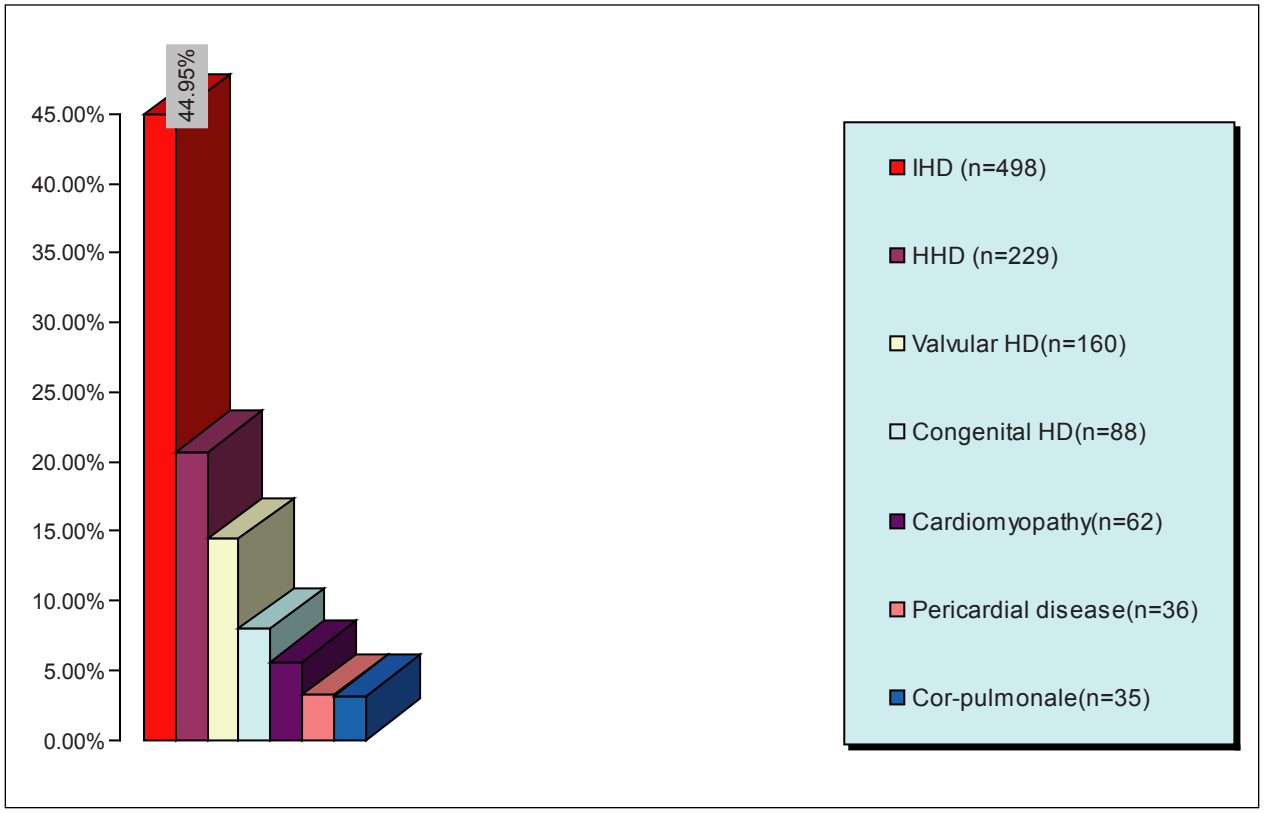

Fig: Bar chart shows frequency of IHD (44.95%) is common among all types of Heart diseases.

Discussion

This echocardiographic based study showed that the common heart diseases in adult Bangladesh were Ischaemic heart disease, hypertensive heart disease, valvular heart disease (mostly rheumatic),cardiomyopathy,pericardial diseases,and cor-pulmonale. and adult congenital heart disease were infrequently diagnosed. Ischaemic heart disease is by far the commonest heart disease in this study. It was well established that this condition forms the bulk and was the foundation of cardiovascular disease in Asia. The relatively frequent diagnoses of rheumatic heart disease, cardiomyopathies and pericardial diseases reflect the impact of infections and infestations on the cardiovascular health of adult in Bangladesh. The large number of normal findings at echocardiography in this study was similar to some previous studies in the world[7]. This can be explained by the fact that many of the referrals came from outside the hospital from different physicians and most often the subjects were not properly screened for heart diseases before referral. Many IHD & hypertensive patients with abnormal electrocardiogram were referred for cardiac function evaluation. The poor predictive value of electrocardiography in identifying patients with cardiac abnormality has been well established. Our findings was not similar to previous similar studies from different parts of Nigeria and which is compared with different study of Nigeria. In a review of 275 echocardiograms performed in Zaria over a 12-month period (1976-1977), Adesanya reported similar findings but our study was not similar to them[8]. In our study ischemic heart disease was more common than Hypertensive heart disease. In a preliminary audit of 100 two-dimensional and Doppler echocardiographic service in a tertiary private hospital in the country, Balogun found that the echocardiographic diagnosis of the aetiology of heart diseases were as follows: hypertensive heart disease (53%), cardiomyopathies (21%), valvular heart disease (7%), pericardial effusion (4%) and ischaemic heart disease (2%). Thirteen percent of their procedure was reported as normal[9]. Ukoh in Benin reviewed 869 patients referred for echocardiography in Benin City (between January 1992 and May 2001), hypertensive heart disease (32.7%), dilated cardiomyopathy (19.2%), rheumatic heart disease (18.1%), and pericardial diseases (12.1%) were the common heart diseases identified[10]. Ischaemic heart disease was uncommon (2.9%).But all of those study was differ from us because our findings is four hundred ninety eight(498) (26.45%) had Ischemic Heart Disease, 229(12.16%) subjects were Hypertensive Heart disease,160 subjects (8.5%) had rheumatic heart disease while 62,(3.3%) had cardiomyopathy. Pericardial diseases, corpulmonale, congenital heart diseases, were present in 36(1.92%), 35 (1.85%), 88(4.67%), respectively. Seven hundred and Seventy Five (41.1%) subjects had normal study.

In our study, among the heart disease excluding normal cases ischemic heart disease was more common(44.9%)Than Hypertensive heart disease (20.67%).And other cases such as, Valvular heart disease((14.4%),Congenital Heart disease(7.95%), Cardiomyopathy(5.6%),Pericardial disease(3.2%),Cor pulmonale(3.1%).

Among ischemic heart disease, more common were Myocardial infarctions than Myocardial hypokinesia. Myocardial infarction was more common in male populations. Anterior MI was more common (77 cases) and which was male predominant.

Further analysis of the 229 hypertensive patients in this study showed that left ventricular hypertrophy (LVH) either concentric LVH or eccentric LVH was present in 67%. The frequency of LV geometry was as follows in the order of decreasing frequency: concentric LVH (60.2%), concentric remodelling (18.2%), normal LV geometry (6.8%) and eccentric LVH (14.8%). The spectrum of chronic rheumatic heart disease in this study was not also similar to earlier finding in Nigeria ,In our study MS was more commonest valvular heart disease and Nigerian study mitral regurgitation being the commonest valve lesion. In Nigeria found dilated cardiomyopathy as the commonest form of cardiomyopathy in Abeokuta similar to other reports but in our study Ischemic dialated cardiomyopathy was more common. The low frequency of hypertrophic cardiomyopathy was similar to reports from the country. So in our report IHD prvelance was very high but other study also demonstrated the low prevalence of ischaemic heart disease in the NIgeria as reported by previous authors[11-13]. Echocardiography (even where M-mode and 2D alone are available) has been shown to be a useful tool in establishing cardiac diagnosis and in evaluating the performance of the heart in various disease conditions. In resource poor setting like ours, it is ideal because it was non-invasive. Worldwide the tool has been shown to be a very useful in clinical patient care and research. In 2003 alone (when the world celebrated the 50th year of existence of

the tool), one can identify more papers using the search term "echocardiography "than in the first 25 years after Edler's initial description combined. Echocardiography was introduced in Bangladesh in the mid 70s mostly in the teaching hospitals. Its growth however has been very slow compared to advanced countries and some developing countries. Currently conventional M-mode, 2-dimensional echocardiography was mostly performed. Some institutions have Doppler and colour echocardiography[19]. So, In our Bangladesh, we should apply Echocardiography for evaluation of different types of heart disease.

In Nigeria, studies emanating from the country have focused on the common cardiovascular diseases in the country such as hypertensive heart disease[14], heart failure, dilated cardiomyopathy including peripartum heart disease[15], and valvular heart disease. Others have also studied cardiac function in diabetes mellitus[16] chronic renal failure, congenital heart diseases[17], mitral valve prolapse[18], sickle cell disease and normal Nigerians. The usefulness of ECG criteria for the diagnosis of left ventricular hypertrophy in Nigerians using echocardiography as standard has also been reported[19]. So, In our Bangladesh, we should apply Echocardiography for evaluation of different types of heart diseases.

Table 5: Comparison of present study with previous studies.

Parameter	*Present study*	*Aje et al[20]*	*Sani et al [7]**	*Ike et al[21]*	*Ukoh et al[22]**	*Agomuoh et al[23]*	*Balogun et al[9]*	*Adesanya et al[8]**
Number	**1883**	**1544**	**594**	**2527**	**869**	**141**	**100**	**249**
Duration	**6 Months**	**19mth**	**24 mth**	**10yrs**	**8yrs**	**36mth**	**30mth**	**12mth**
IHD	**498**	**18**	**23**	**20**	**22**	**0**	**2**	**0**
HHD	**229**	**684**	**228**	**436**	**249**	**48**	**53**	**24**
VHD	**160**	**54**	**64**	**868**	**152**	**13**	**7**	**14**
CM	**62**	**40**	**144**	**237**	**165**	**28**	**21**	**14**
PD	**36**	**22**	**7**	**228**	**12**	**6**	**4**	**20**
CP	**35**	**15**	**7**	**31**	**12**	**1**	**0**	**0**
CHD	**88**	**10**	**6**	**334**	**52**	**2**	**0**	**0**
NS	**775**	**674**	**100**	**275**	**58**	**43**	**13**	**17**

* Classification of various conditions was reclassified. Only the main common diagnoses were included. HHD = Hypertensive Heart Disease, VHD= Valvular Heart Disease, CM = Cardiomyopathy, PD = Pericardial Diseases, CP = Cor-pulmonale, IHD = Ischaemic Heart Disease, CHD = Congenital Heart Disease, NS = Normal Study

Figure 1-6 Shows different Types of Heart disease on Echocardiography

Fig 1: Concentric LVH with Diastolic dysfunction.

Fig 2: Atrial Septal Defect (ASD).

Fig 3: Ventricular Septal defect (VSD).

Fig 4: Multiple valvular heart disease.(MS,MR,AR)

Fig 5: Aortic valve disease (AS,AR).

Fig 6: Ischemic heart disease (OMI anterior)-0n 2D -M-MOD

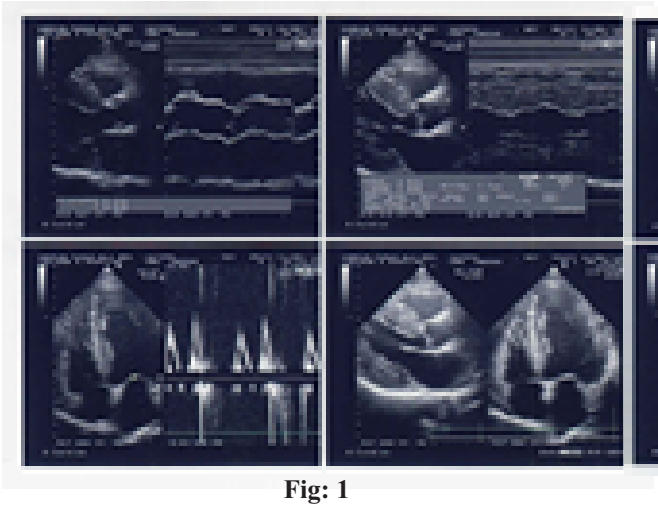

Fig: 1

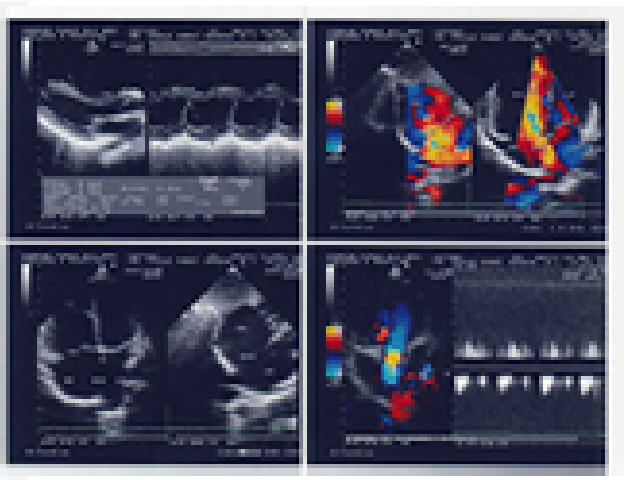

Fig: 2

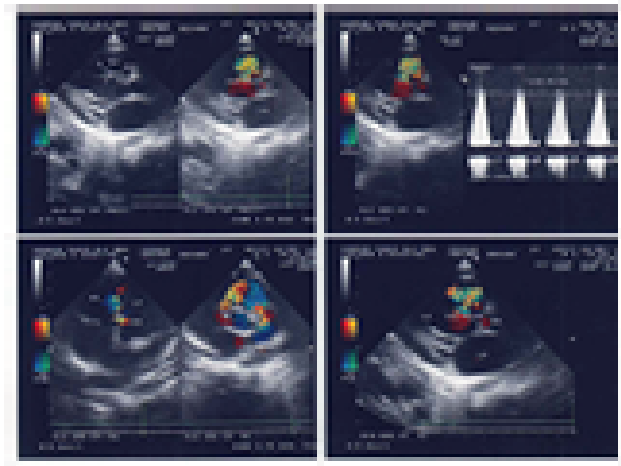

Fig: 3

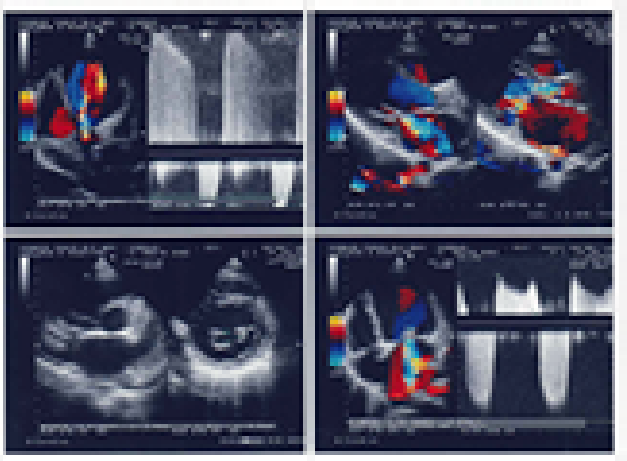

Fig: 4

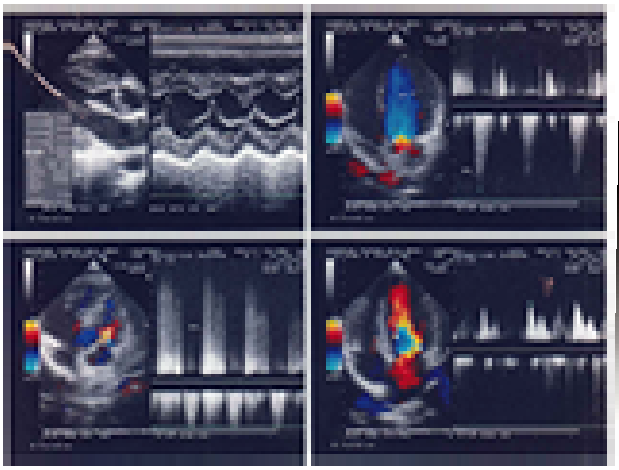

Fig: 5

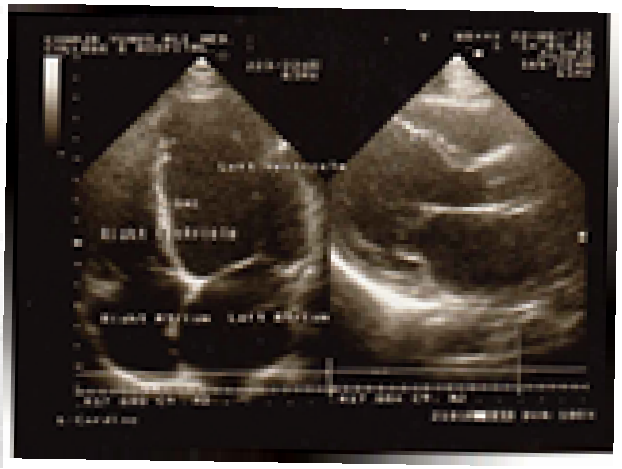

Fig: 6

Conclusion

Our study showed that Ischemic heart disease, Hypertensive heart disease, chronic rheumatic heart disease, cardiomyopathy, Cor-pulmonale and pericardial diseases are the common causes of heart disease in Bangladesh. On which, Ischemic Heart disease was predominant among all kinds of heart disease. So we should modify our life style such as cessation of smoking, regular exercise,mantain balance diet, regular monitoring of BP and blood glucose,etc. It also showed that the increasing burden of non-communicable diseases in the country coupled with the impact of infective conditions on the heart such as tuberculosis. There is therefore need for strategies to control cardiovascular risk factors such as hypertension, obesity, and physical inactivity. There is also need for improvement in housing and environmental sanitation as well early detection and treatment of throat infection.

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