

Echocardiography in the University of Port Harcourt Teaching Hospital: April 2000 to March 2003.

D.I. Agomuoh MBBS, FMCP, FWACP, M.R.Akpa MBBS, FWACP, D.D.Alasia MBBCh, MWACP

Department of Internal Medicine, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.

ABSTRACT

Background: Echocardiography is a cheap and non-invasive technique for the investigation of cardiac diseases with reliable levels of accuracy. Echocardiography services commenced in the Cardiac unit of the University of Port Harcourt Teaching Hospital (UPTH) in April 2000. There is a need to establish an accurate pattern of cardiac diseases seen in the centre based on echocardiography assessment. The aim of the study was to review the pattern of cardiac diseases diagnosed by echocardiography in the cardiology unit of the University of Port Harcourt Teaching hospital.

Method: A prospective descriptive study of patients referred to the cardiology unit of UPTH for echocardiography for a variety of cardiac complain was done. Subjects had two dimensional and M-mode echocardiography assessment using a Siemens Sonoline SL 1 machine with a 3.5 MHz sector probe.

Results: One hundred and forty one subjects aged between 16-84 years with a mean age of 44.2 ± 11.5 years had echocardiography assessment over the three year period. Eighty two (58.2%) of the subjects were males while 59(41.8%) were females. Forty eight (34.0%) of subjects had hypertensive heart disease, 28(19.9%) had Cardiomyopathies, 13(9.2%) had rheumatic heart disease. Pericardial disease, congenital heart disease and cor pulmonale was found in 6(4.3%), 2(1.4%) and 1(0.7%) respectively. Fourty three (30.5%) of subjects had normal findings on echocardiography.

Conclusion: Hypertensive heart disease was found to be the most prevalent cardiac condition followed by the cardiomyopathies and rheumatic heart disease in that order. This trend is very similar to what obtains in sub Saharan Africa as documented by similar studies.

KEY WORDS: Cardiac disease; Echocardiography; Port Harcourt.

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INTRODUCTION

Cardiovascular imaging techniques have contributed immensely in improving the practice of cardiology. Echocardiography is a major mode of cardiovascular imaging with versatile applications. It is a cheap and non-invasive technique for the investigation of cardiac disease with advantages of reproducibility of results,

instantaneous images /results, portability of equipment and the absence of special pre-procedure preparation.

The basic principle of Echocardiography is the utilisation of reflected ultrasound waves to produce images of the heart which may be in unidirectional (M mode), two dimensional (2D) and in recent times third and fourth dimensional views. The range of sound frequencies is above that of human hearing in the range of 2.5 to 10MHz. The sound waves are transmitted via a transducer consisting of piezo-electric elements which convert electrical energy to sound which can be directed to the heart via a Trans - thoracic or Trans -oesophageal window with multiple transducer rotations and angulations to enable visualisation of cardiac structures. Echocardiography improves the accuracy of diagnosis of cardiac diseases. However, the accuracy of the procedure is dependent on the operator, the echocardiography equipment and the interpreter of the study.

Echocardiography services commenced in the university of Port Harcourt teaching hospital in April 2000 inspite of its use as a cardiac diagnostic tool for over two decades.

This study describes echocardiographic experience in the Cardiology unit of the University of Port Harcourt Teaching hospital from April 2000 to March 2003.

METHODOLOGY

Setting and sample

This is a prospective cross sectional descriptive study of patients referred to the cardiac unit of the University of Port Harcourt Teaching Hospital for echocardiography over a three year period from April 2000 to March 2003. The age range of subjects was 15 to 84-years.

Procedure

Patients were booked for the weekly echocardiography sessions after referral and subjected to brief clerking and physical examination before scanning. Echocardiography was done using a Siemens Sonoline SL1 ultrasound machine with a 3.5 MHz sector probe. Images were obtained from the parasternal, apical, subcostal and suprasternal windows for overall assessment of cardiac structure and function. Measurements were done using Mmode and concomitant 2-D visualisation for improved accuracy of measurements. Using standard procedure chamber size,

septal and wall thickness were measured. The pericardium and valves were viewed; ejection fraction and fractional shortening were calculated.

The Limitations of the study was the unavailability of Doppler facilities thus valve functions could not be properly assessed and pictures of interesting findings were not obtained as the printers were non functional.

Subjects were categorised by age group, sex and echocardiography diagnosis. Analysis was by simple percentages and ratios, with results presented in tabular form and charts.

Diagnostic features used for the various cardiac diseases were based on M-mode and 2D studies and were as follows.

Hypertensive heart disease: On 2-dimensional and M-mode examination, the interventricular septum was thickened, as was the posterior left ventricular wall (>1.1cm) that is symmetrical left ventricular hypertrophy as different from the asymmetric type that occurs in hypertrophic obstructive cardiomyopathy.

Evidence of left ventricular systolic dysfunction included dilated left ventricles with low fractional shortening and ejection fraction.

Dilated Cardiomyopathy: This diagnosis was made when the cardiac chamber dimensions were wider than the normal values, especially the left ventricle and the left atrium. Other criteria utilized were thin inter-ventricular septa (<0.6cm) and also dyskinesia of the septum. Left ventricular diameter in diastole (LVDd) was usually more than 5.6cm. Other occasional features were calcified walls and intra-cardiac thrombi.

Rheumatic Heart Disease: This diagnosis was made studying the 2D and M mode images of the heart valves. 2D parasternal long Axis view (PLA view) Thickened valve leaflets with calcification. Other findings were diminished movement of the valves, doming of one or more leaflets when the valve is fully opened. Other changes seen included left atria enlargement, abnormal ventricular septal motion and fluttering of anterior mitral valve leaflet during diastole in patients with aortic incompetence.

M Mode (PLA view): This shows normal pattern loss and stenotic boxes in mitral stenosis. The leaflets of affected valves were diffusely thickened, occasionally with fusion of the commissures and chordae tendineae. Increased echodensity of the valves signified calcification.

Pericardial effusion/pericarditis: For pericarditis, the features included shiny pericardium with occasional calcium deposits in constrictive pericarditis. Pericardial effusion appeared as echo free zone between the myocardium and the intense echo of the parietal pericardium.

Hypertrophic cardiomyopathy: The left ventricle is small,

with a grossly thickened, immobile interventricular septum, asymmetric septal hypertrophy (ASH). There is a characteristic, though poorly understood, displacement of the mitral valve apparatus towards the septum in systole; systolic anterior motion (SAM⁷).

Restrictive cardiomyopathy: This usually shows as symmetrical myocardial thickening with often normal systolic ejection fraction.

Cor Pulmonale: 2D echocardiography shows as increased thickness of the right ventricular wall with paradoxical motion of the interventricular septum during systole. There may also be right ventricular dilatation.

RESULTS

A total of 141 subjects had echocardiography over the 3-year study period. Subject's age ranged between 16-18years with a mean age of 44.2 ± 11.5 years.

Fig 1 shows the age and sex distribution of patients; eighty two (58.2%) of them were males while 59(41.8%) were females.

Fig 2 shows that 48(34.0%) of subjects had hypertensive heart disease making it the most commonly diagnosed condition, followed by cardiomyopathies seen in 28(19.9%) and Rheumatic heart disease in 13(9.2%) of subjects. Pericardial disease, Congenital heart disease and Cor pulmonale were found in 6(4.3%), 2(1.4%) and 1(0.7%) of subjects respectively. Forty three (30.5%) of the patients had normal studies.

Figs 3 and 4 indicates that more males were seen with hypertensive heart disease 36(75%) than females 12(25%). Patients in the 45-54 year and 35-44 year age groups were most affected by hypertensive heart disease-15(31.3%) and 14(29.2%) respectively while it was least seen in the 25-34 and 15-24 year age groups with 5(1.4%) and 0(0%) respectively.

Cardiomyopathies were seen in 28 patients of whom 60.7% were male and 39.3% female. Dilated Cardiomyopathy was the most common type of cardiomyopathy, seen in 24(85.7%) followed by Hypertrophic cardiomyopathy found in 3(10.7%) and Endomyocardial fibrosis in 1(3.6%). All three subjects with hypertrophic cardiomyopathy were males. These findings are shown in Tables I - II.

Table III shows the distribution of patients with rheumatic heart disease 69.2% of these were female while 30.8% were male. Patients in the 35-44 years age group 6(46.1%) constituted the majority with rheumatic heart disease while the 25-34 and 45-54 year had 3(23.1%) each. No cases were seen in the 15-24, 65-74 and 75-84 years age groups. Seven patients (53.7%) had combined mitral and aortic valve disease, 5(38.5%) had isolated mitral valve disease while 1(7.7%) had combined mitral, aortic and tricuspid valve disease.

Pericardial disease was seen in 6(4.3%) of study. Subjects. 16.7% of them were male while 83.3% were female. Pericardial effusion and pericarditis was evenly distributed among the study group. Pericardial disease was most common in the 25-34 year age group with 50% cases.

Congenital heart disease was seen in 2 patients in the 15-24-years age group. Both of them had ventricular septal defects (VSD) of the peri membranous type. Cor pulmonale was seen in one male subject in the 55-64-years age group.

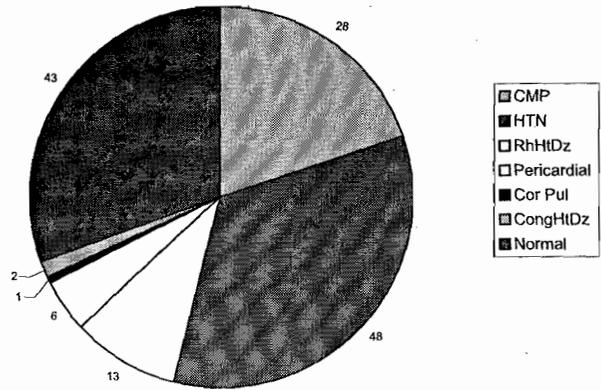


Fig 1. Pattern of Echocardiography findings.

Table I. Distribution of Subjects with Cardiomyopathy by Age and Sex.

| Age group (years) | Male | Female | Total |
|-------------------|-----------|-----------|------------|
| 15-24 | 0 | 2 | 2(7.1%) |
| 25-34 | 2 | 4 | 6(21.4%) |
| 35-44 | 9 | 0 | 9(32.1%) |
| 45-54 | 3 | 2 | 5(17.9%) |
| 55-64 | 3 | 1 | 4(14.3%) |
| 65-74 | 0 | 1 | 1(3.6%) |
| 75-84 | 0 | 1 | 1(3.6%) |
| Total | 17(60.7%) | 11(39.3%) | 28(100.0%) |

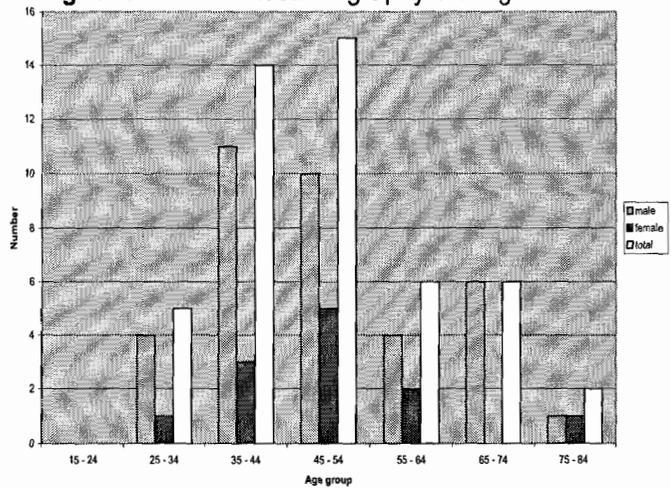


Fig 2. Age and sex distribution of subjects with hypertensive heart disease.

Table II. Distribution of Subjects with dilated Cardiomyopathy by Age and Sex.

| Age group (Years) | Male | Female | Total |
|-------------------|-----------|----------|------------|
| 15-24 | 1 | 0 | 1(4.2%) |
| 25-34 | 2 | 4 | 6(25.0%) |
| 35-44 | 6 | 0 | 6(25.0%) |
| 45-54 | 3 | 2 | 5(20.8%) |
| 55-64 | 3 | 1 | 4(16.7%) |
| 65-74 | 0 | 1 | 1(4.2%) |
| 75-84 | 0 | 1 | 1(4.2%) |
| Total | 15(62.5%) | 9(37.5%) | 24(100.0%) |

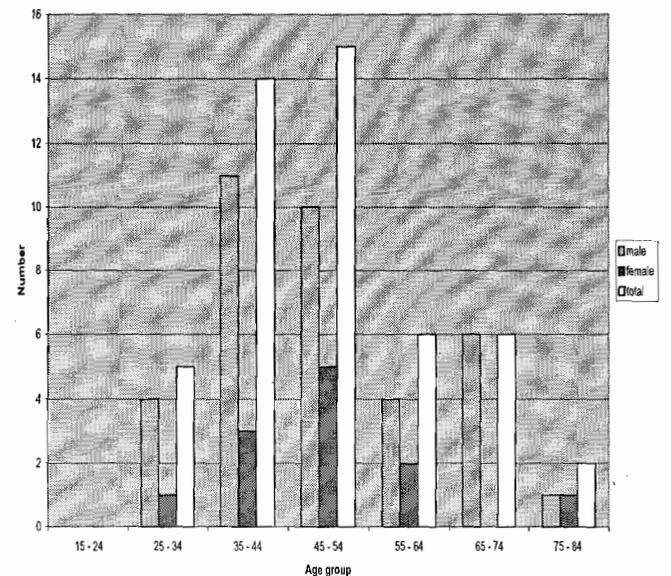


Fig 3. Age and sex distribution of subjects with hypertensive heart disease.

Table III. Distribution of Subjects with Rheumatic Heart Disease.

| Age group (Years) | Male | Female | Total |
|-------------------|----------|----------|------------|
| 15-24 | 0 | 0 | 0(0.0%) |
| 25-34 | 2 | 1 | 3(23.7%) |
| 35-44 | 4 | 2 | 6(46.1%) |
| 45-54 | 3 | 0 | 3(23.1%) |
| 55-64 | 0 | 1 | 1(7.7%) |
| 65-74 | 0 | 0 | 0(0.0%) |
| 75-84 | 0 | 0 | 0(0.0%) |
| Total | 9(69.2%) | 4(30.8%) | 13(100.0%) |

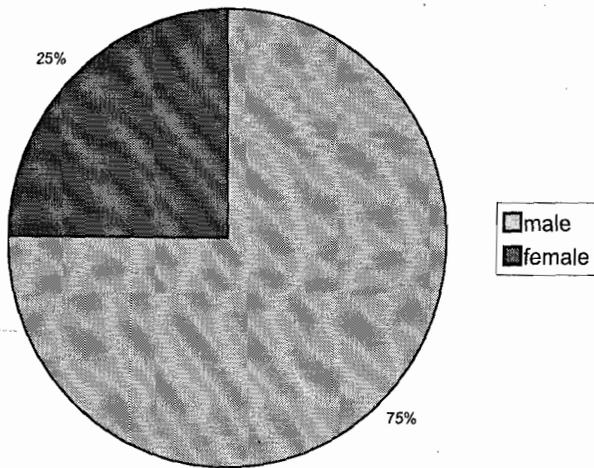


Fig 4. Sex distribution of subjects with hypertensive heart disease.

DISCUSSION

Out of the 141 patients examined echocardiographically, 43 (30.5%) were found to be normal. This is approximately the same proportion found to be normal in the Harare study¹. Out of 1,507 patients referred for echocardiographic evaluation, 76.5% were abnormal in their series.

The age range of the study population was 16 to 84-years with a mean of 44.2 ± 11.5 years. This represents a young population and is similar to the pattern in other sub-Saharan African countries. In the National Cardiothoracic Centre in Accra Ghana² a four year echocardiographic evaluation of heart failure patients had a mean age of 42.3 ± 0.9 -years. However in similar studies in London³ and Saudi Arabia⁴ the pattern was different, with a higher mean age.

The male to female ratio in the study was 1.4:1, which is similar to that of the Ghana study² 1.2:1 and the Saudi study⁴ with 1.5:1 these figures agree with the global trend of having higher prevalence of cardiac diseases in males up till the age of menopause in females when the gap begins to close up.

There were significant differences between this study and similar studies done in London and Saudi Arabian in terms of pattern of heart diseases. While other studies in the sub-Saharan region showed marked similarities through with areas of differences.

Hypertensive heart disease (HHD) was the most prevalent disease in this study 48 (34.0%) as was the case in the Zaria¹⁰, Ghana² and Okada¹⁸ series.

This was followed by cardiomyopathies 28(19.9%), Rheumatic heart disease 13(9.2%), pericardial diseases 6(4.3%), congenital heart diseases 2(1.3%) and Cor pulmonale-1(0.7%). HHD was found to be more common among the older age group i.e. 35-years and above. It

was also more prevalent in the males (75%) than in the females (25%). The pattern of hypertensive heart disease increasing with age has long been documented in earlier studies^{5, 6, 7}, however there are communities that do not have a rising prevalence of HTN with age these include the Samburu tribe in East Africa and the nomadic herdsmen of Northern Nigeria near Kaduna⁵.

Different studies have found hypertension and hypertensive heart disease more prevalent in males than females^{6, 8} while Falase *et al*⁹ had reported no difference in the prevalence.

The cardiomyopathies were the second most prevalent condition in the study. There were 28 subjects making (19.9%) of the study population. Dilated cardiomyopathy was seen in 85.7% of the subjects with cardiomyopathy. In our series we had just one case of endomyocardial fibrosis. EMF is said to be more prevalent in the tropical rain forest where it has been linked to eosinophilia which may be due to parasites. Possible reasons for the dearth of EMF cases in this study include improving living standards and better medical care. In contrast to our findings EMF was highly prevalent in the Ghanaian series, where it and hypertrophic cardiomyopathy (HOCM) had a combined prevalence of 22.9%.

In our series, all three cases of hypertrophic cardiomyopathy (HOCM) were males. HOCM has been found to be inherited as an autosomal dominant trait with high penetrance¹².

Rheumatic heart disease is known to be more prevalent in less affluent countries. Historically, the disease has been associated with poverty, poor housing, over crowding and under nutrition. Improved living standards and better housing has limited person-to-person contact, thereby minimizing the spread of streptococcal infection. Other factors which have contributed to the decrease include the use of antibiotics¹⁴, improved health care delivery¹⁵ and probably reduced virulence of the streptococcus group A¹⁶. There has been a significant decrease in the mortality and morbidity from rheumatic heart disease in the Western world¹⁷. The findings in this study suggest a transition in the pattern of rheumatic heart disease to what is seen in the western world where the prevalence has declined. Rheumatic heart disease was found to be more prevalent in the 35 to 54-year age group and also more common in females than males 69.2% versus 30.8% respectively (see table III). The prevalence rate in our study (9.2%) was much lower than the 20.1% in the Ghana study. Rheumatic heart disease was the most prevalent cardiac condition in a study of South African blacks at a cardiac referral¹⁷ centre. It accounted for 42% of cardiac cases there. This picture may reflect poor socio-economic status among black

South Africans.

Pericardial disease was found in 6 (4.3%) of the study population. There were three cases of pericardial effusion and three of pericarditis. These conditions were more prevalent in the younger age group; 15 to 34- years and also more prevalent in females.

Tuberculosis is a common cause of pericardial disease in Africa and Asia though rare in indigenous UK populations¹³.

The low prevalence of pericardial disease in this study may be as a result of earlier diagnosis and treatment of tuberculosis.

Congenital Heart Diseases: These were few in number 2(1.4%). Both cases were ventricular septal defects of the peri-membranous type. This may be due to the fact that more adults were seen in this study and may not reflect the true prevalence of congenital heart disease in the community. The prevalence of congenital heart disease was much higher in the Ghanaian series were they had a prevalence of 9.8 percent². It should be noted that a lot of cardiac valve surgeries are done in that centre.

Ischaemic Heart Disease: Did not feature prominently in our study population. There was no single case of subjects with echocardiography features of ischemic heart muscle disease .

CONCLUSION

The study concludes that hypertensive heart disease is the most prevalent cardiac disease in Port Harcourt followed by dilated cardiomyopathy, rheumatic heart disease and pericardial heart disease in that order. This trend is very similar to what obtains in the other sub-Saharan regions of Africa.

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