

Spectrum of Echocardiographic Abnormalities among 168 Consecutive Referrals to an Urban Private Hospital in South-Western Nigeria

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ABSTRACT: Trans-thoracic echocardiography (TTE) is an important non-invasive cardiac examination that provides structural and functional information. It is useful in the diagnosis of cardiac diseases and often guides the management and follow-up of patients with cardiovascular diseases (CVD). The study aimed to present an audit of the echocardiograms performed in an urban private hospital over a two-year period in order to define the pattern of cardiac diseases in our center. Echocardiogram reports of 168 consecutive patients performed between May 2011 and April 2013 at an organized private sector hospital in Lagos, south-west Nigeria were reviewed. Studies were performed with a Toshiba Nemio XG ultrasound machine. The data obtained were analyzed for mean age, sex, clinical indications, and echocardiographic diagnosis in the study subjects. A total of 168 echocardiography reports were examined, comprising of 92 males (54.8%) and 76 females (45.2%). The age range of the subjects was 10–76 years (mean 42.5 ± 12.1 years). The commonest indication for echocardiography was systemic hypertension and hypertension related causes (38.1%), followed by abnormal resting electrocardiogram (14.9%). Routine annual medical screening was the next most common indication, representing 13.1% of the indications for echocardiography. The other indications are as presented in Table 1. The echocardiogram was normal in 64.3% of the subjects. The commonest abnormality detected was hypertensive heart disease (HHD); accounting for 9.6% of the subjects studied. Isolated atrial enlargement (left, right, or bi-atrial) was the next most common abnormality accounting for 6% of the echocardiographic diagnosis. Pulmonary hypertension was the next most common diagnosis accounting for 4.8% of our findings. The other echocardiographic diagnoses are as listed in Table 2. Hypertension represents the commonest indication for echocardiography. Normal echocardiogram was the commonest echocardiographic finding while HHD was the commonest echocardiographic abnormality. The prevalence of ischemic heart disease by echocardiography was 2.4%. There was no case of rheumatic heart disease (RHD). The prevalence of hypertrophic cardiomyopathy (HCM) was 1.2%. Ease of access to echocardiography may influence the findings in an echocardiographic audit and policy makers should incorporate appropriateness criteria into their guidelines for reimbursement.

KEYWORDS: echocardiography, hypertension, normal echocardiogram, hypertensive heart disease

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Introduction

Trans-thoracic echocardiography (TTE) is an important non-invasive investigative tool in the evaluation of cardiovascular diseases (CVD). It can provide comprehensive information about cardiac structure and function, and often guides the management of patients.¹

In Nigeria, access to echocardiography is increasing, especially in many tertiary health care facilities but is still low because of high cost and concentration of facilities in the urban centers.² Previous studies on the indication for

echocardiography had documented valvular heart disease and HHD as the commonest indications for echocardiography in Nigeria.^{3–5} However, some of these studies may not reflect possible changes in the spectrum of CVD in Nigeria. Furthermore, most of these studies were conducted in government hospitals where most patients paid out-of-pocket. With a nascent health insurance system in Nigeria that is striving to get more people on board, policy makers may find our results useful as a guide on issues that may impact reimbursement. Furthermore, clinicians may derive useful information on



possible differences in patient presentation under an insured scheme.

We therefore present a two-year audit of echocardiographic services in a private establishment set up to cater for only health-insured clients.

Materials and Methods

Echocardiograms of 168 patients, who were referred to the cardiologist attending CNL hospital, Lagos, over a two year period (between May 2011 and April 2013) were retrospectively studied. Echocardiographic examinations were performed with Toshiba Nemio XG ultrasound systems. All patients were examined echocardiographically with M-mode, two-dimensional, color, pulsed, and continuous wave Doppler using standard procedures.^{6,7} The data obtained were analyzed for age, sex, clinical indication, and final echocardiographic diagnosis.

Statistical Analysis

Continuous variables were expressed as mean \pm standard deviation, while qualitative variables were expressed in frequencies and percentages. All statistical analyses were performed using the commercially available Statistical Package for the Social Sciences version 15 software (SPSS Inc, Chicago, IL, USA).

Results

A total of 168 echocardiography reports were examined, comprising of 92 males (54.8%) and 76 females (45.2%). The age range of the subjects was 10–76 years (mean 42.5 ± 12.1 years). The commonest indication for echocardiography was systemic hypertension and hypertension related causes (38.1%), followed by abnormal resting electrocardiogram (14.9%). Routine annual medical screening was the next most common indication, representing 13.1% of the indications for echocardiography. The other indications are as presented in Table 1. The echocardiogram was normal in 64.3% of the subjects. The commonest abnormality detected was HHD; accounting for 9.6% of the subjects studied. Isolated atrial enlargement (left, right, or bi-atrial) was the next most common abnormality accounting for 6% of the echocardiographic diagnosis. Pulmonary hypertension was the next most common diagnosis accounting for 4.8% of our findings. The other echocardiographic diagnoses are as listed in Table 2.

Hypertension represents the commonest indication for echocardiography. The prevalence of ischemic heart disease by echocardiography was 2.4%. There was no case of rheumatic heart disease (RHD). The prevalence of hypertrophic cardiomyopathy (HCM) was 1.2%.

Discussion

Hypertension was the commonest indication for echocardiography referral in our unit. Normal echocardiogram was the commonest echocardiographic finding in this series. HHD was the commonest echocardiographic abnormality. This finding is in keeping with previous studies on echocardiography

Table 1.

INDICATION	FREQUENCY	PERCENTAGE
Hypertension	64	38.1
Abnormal Electrocardiogram	25	14.9
Routine Examination	22	13
Chest Pain	20	11.9
Pre-participation Sports Evaluation	10	5.9
Heart Failure Symptoms	5	3
Syncope/ loss of consciousness	4	2.4
Cardiac Murmur	4	2.4
Valvular Heart Disease	4	2.4
Anxiety Disorder	3	1.8
Sickle Cell Anaemia	3	1.8
Thyroid abnormalities	2	1.2
Ischemic Heart Disease	2	1.2
Total	168	100%

audits where hypertension remained the commonest indication for referral and HHD was the commonest pathologic finding.^{8–11}

Despite the high prevalence (38.1%) of hypertension in our population, up to 46.6% of the hypertensive patients had a normal study, with 21.9% of the hypertensive subjects having echocardiographic evidence of HHD. Of the study population, 3.6% had left ventricular systolic dysfunction. Compared with other studies,^{4,8,12} we observed a much higher prevalence of normal findings. Aje et al.¹³ had also found that a significant proportion (36.5%) of the patients in their series had normal findings. This finding is either due to access to

Table 2.

DIAGNOSIS	FREQUENCY	PERCENTAGE
Normal Study	108	64.3
Hypertensive Heart Disease	16	9.6
Atrial Enlargement	10	6
Pulmonary Hypertension	8	4.8
Mitral Valve Prolapse	5	3
Valve pathologies (mitral, aortic, pulmonary)	6	3.6
Ischemic Heart Disease	4	2.4
Patent Foramen Ovale	3	1.8
Hypertrophic Cardiomyopathy	2	1.2
Cor-TriaTriatum	2	1.2
Obesity Cardiomyopathy	1	0.6
Tetralogy of Fallot	1	0.6
Bicuspid Aortic Valve	1	0.6
Atrial Septal Aneurysm	1	0.6
Total	168	100%

free medications and easy follow-up, which may translate to a lower prevalence of HHD or may reflect inappropriate use of this modality of investigation. Recently, the American College of Cardiologists Foundation in association with other bodies issued the appropriateness criteria for trans-thoracic and trans-esophageal echocardiography.¹⁴ This is aimed at encouraging the rational use of this imaging modality. This view is further supported by the finding that 13.1% of our population requested to have this test as part of their routine medical screening and a further 6% were either referred or self-requested to have one on account of pre-participation sports evaluation. This reflects the high level of CVD awareness among the population reviewed. Compared with previous studies, medical screening or routine tests as an indication for echocardiography accounted for only 1.75 and 6% of the indications for echocardiography in previous studies.^{4,8} This further supports the view that access to this test was relatively easier in our population.

Two cases of HCM were diagnosed among the hypertensive population. Our diagnosis was confirmed in both instances by perfusion cardiac magnetic resonance imaging. One of the patients demonstrated hypertrophy of the basal and mid-septum with a maximum mid-septum of 25 mm. With adenosine, there were HCM-like perfusion defects in the hypertrophied areas in a pattern typically seen in HCM. There was minor late gadolinium enhancement (LGE) in the hypertrophied septum. The second case demonstrated left ventricular hypertrophy (LVH) reaching 17 mm – primarily of apical disposition. Tissue characterization showed a very small focus of sub-endocardial LGE in the apical antero-septum with some diffuseness toward the apex. Both patients are presently on conservative management and are doing very well as of the last clinic attendance. HCM is a close differential of HHD in Nigeria; and when HCM exists in a hypertensive patient, this diagnosis may be easily missed without further testing.

The only case of tetralogy of Fallot (TOF) had a 1.45 cm non-restrictive ventricular septal defect overriding the aorta (Fig. 1). The pulmonary stenosis was severe; with a peak pressure gradient across the valve ranging between 81 and 90 mmHg and associated with right ventricular hypertrophy (10 mm). This represents a rare case of cyanotic congenital heart disease surviving into adulthood likely because of undetected aorticopulmonary connections. This patient had complete repair with a trans-annular patch and pulmonary valve replacement using a 25 mm perimount Bovine pericardial prosthesis. Although survival into adulthood is rare without corrective surgery,¹⁵ a similar case has been earlier reported by Ojji et al.¹⁶

Out of the eight cases of pulmonary hypertension, two were associated with hemoglobin SS genotype and one was secondary to end-stage pulmonary sarcoidosis, which resulted in mortality. The underlying etiology for the pulmonary hypertension in the remaining cases was undetermined as

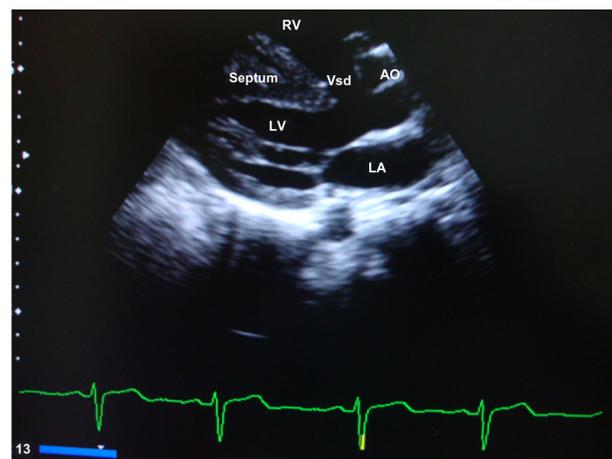


Figure 1. Tetralogy of Fallot.

Abbreviations: LA, left atrium; LV, left ventricle; RV, right ventricle; Ao, aortic root; vsd, ventricular septal defect.

these were incidental findings in largely asymptomatic patients who declined further investigations.

We had previously reported one of the cases of cor-triatriatum in this series.¹⁷ Similarly, we had previously reported one of the four cases of ischemic heart disease.¹⁸ We had also earlier reported the only case of atrial septal aneurysm presented here.¹⁹

In our study, the prevalence of IHD was 2.4%. This confirms a rising prevalence of IHD in Nigeria and is in keeping with previous findings.^{9,10} We here present four patients with previous heart surgery (mitral valve repair, aortic valve replacement, corrected pulmonary stenosis, and resected sub-aortic membrane). There were two cases of degenerative valve disease (mitral annular calcification and mixed aortic valve disease). Of note, there was no case of RHD in our series. This finding is in keeping with previous studies suggesting a downward trend in the incidence of RHD.^{8,20} Another possible reason for this is the socio-economic class to which most of the subjects in the study belong to. The finding by Ike²¹ that valvular heart disease was the commonest indication as well as echocardiographic diagnosis at Enugu may not be unconnected with the capacity of the unit as a national referral hospital for cardiovascular surgery in Nigeria. Furthermore, our population was predominantly adult and this may also have accounted for the absence of RHD in our series.

The only pediatric patient in our series, still on follow-up was referred on account of Marfan's syndrome. He was found to have a dilated aortic root with aneurysmal sinus of valsalva. This was confirmed on chest computerized tomographic (CT) scan.

The only case of bicuspid aortic valve (BAV) was type I with fusion of the right and left coronary cusps resulting in mild aortic stenosis (Fig. 2). BAV is the most common congenital cardiac anomaly, with an estimated incidence of 0.9–2% in the general population.^{22,23} The patient is currently on periodic follow-up. The patient was an asymptomatic

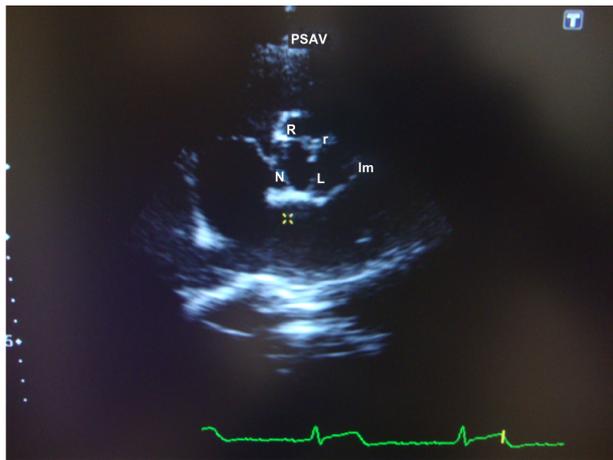


Figure 2. Bicuspid aortic valve.

Abbreviations: R, right coronary cusp; L, left coronary cusp; N, non-coronary cusp; r, false raphe; lm, left main coronary artery ostium.

young man found to have a systolic murmur during his pre-employment screening. Included in our audit is a rare case of obesity cardiomyopathy in a young man with a body mass index of 48.2 kg/m².

Study Limitation

The sample size in our study is a limitation, however, the study is ongoing and we hope to generate a larger sample size with the aim of performing statistical analysis on the different subgroups in the near future.

Conclusion

Hypertension represents the commonest indication for echocardiography. Normal echocardiogram was the commonest echocardiographic finding and HHD was the commonest abnormality detected. There was no case of RHD in our series. Ease of access to echocardiography may influence the findings in an echocardiographic audit and policy makers should incorporate appropriateness criteria into their guidelines for reimbursement.

Author Contributions

ATO was involved in the conception of the report and initial drafting of the manuscript. AAA, OOO, and JOP were responsible for jointly developing the structure and arguments for the paper. All authors reviewed and approved the final manuscript.

DISCLOSURES AND ETHICS

As a requirement of publication the authors have provided signed confirmation of their compliance with ethical and legal obligations including but not limited to compliance with ICMJE authorship and competing interests guidelines, that the article is neither under consideration for publication nor published elsewhere, of their compliance with legal and ethical guidelines concerning human and animal research participants

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