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ORIGINAL RESEARCH

Two-dimensional and Doppler echocardiographic evaluation of patients presenting at Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria: a prospective study of 2501 subjects

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Background: Echocardiography remains a key noninvasive cardiac investigative tool in the management of patients, especially in a developing economy like Nigeria. In this study, we investigated the indications for transthoracic echocardiography and spectrum of cardiac disease found in patients referred to our cardiac unit for echocardiography.

Methods: A prospective two-dimensional, pulsed, continuous, and color-flow Doppler echocardiographic evaluation was done using the transthoracic approach in 2501 patients over an eight-year period. Univariate data analysis was performed for mean age, gender, clinical indications, and diagnoses.

Results: The subject age range was less than 12 months to 97 years (mean 52.39 years). There were 1352 (54.06%) males and 1149 (45.94%) females. The most common indication for echocardiography was hypertension (52.1%) followed by congestive cardiac failure (13.9%). Others were for screening (6.1%), arrhythmias (5%), cerebrovascular disease (5%), chest pain (3.3%), chronic kidney disease (3.2%), congenital heart disease (2.6%), cardiomyopathy (1.8%), rheumatic heart disease (1.7%), diabetes mellitus (1.3%), thyrocardiac disease (1.2%), ischemic heart disease (1.2%), and pericardial disease (1.1%). The echocardiographic diagnosis was hypertensive heart disease in 59.4% of subjects and normal in 14.1%. Other echocardiographic diagnoses included rheumatic heart disease (3.1%), congenital heart disease (2.1%), cardiomyopathy (1.7%), pericardial disease (1.1%), and ischemic heart disease (0.1%).

Conclusion: Hypertension and its cardiac complications is the most common echocardiographic indication and diagnosis at our unit.

Keywords: echocardiography, cardiac diseases, prospective, indications, diagnosis, Nigeria

Introduction

Echocardiography remains a key noninvasive investigative tool in the current management of cardiac patients, especially in a developing economy like Nigeria. It is undoubtedly the fifth dimension in cardiovascular examination after inspection, palpation, percussion, and auscultation.[1] It gives relevant morphological and hemodynamic information which often guides the management of cardiac patients.[2,3] The field of echocardiography is rapidly expanding from the use of M-mode in the 1950s to three-dimensional, Doppler, and transesophageal echocardiography in present day cardiology.[4] This cost-effective modality of cardiac assessment has a high degree of

sensitivity and specificity, and when performed by a trained operator is second only to electrocardiography.[5] There is a strong correlation between echocardiographic findings and those of cardiac catheterization and radionuclide studies.[6,7]

The widespread availability of and accessibility to echocardiographic services in the Western world have greatly enhanced the classification and effective management of cardiovascular disease.[8] This is not so in Nigeria, despite increasing availability in many tertiary health care facilities due to high cost and concentration of facilities in the urban centers.[9] Understanding the pattern of cardiac disease is important in strategic planning of the use of scarce resources in the management of affected patients and preventive interventions to reduce the burden of disease.

To date, there are only a few reports in Nigeria of two-dimensional and Doppler echocardiographic evaluation in which a large number of patients with cardiac disease were studied.[8,10,11] A study of this nature at our tertiary health facility in South-West Nigeria in a large population of patients would give a more balanced view of the frequencies of these echocardiographically diagnosed cardiac diseases in Nigeria. This will further complement the available information on echocardiographic studies at the global level.

Therefore, we undertook a prospective eight-year study of two-dimensional, pulsed, continuous, and color-flow Doppler transthoracic echocardiographic evaluation of 2501 patients referred for echocardiography to the cardiac care unit of a tertiary hospital in South-West Nigeria. This will help to define further the pattern of cardiac disease in our environment, and also add to the national and global database.

Materials and methods

We studied echocardiograms for 2501 of 2517 patients referred from south-western states with cardiac complaints during 2002–2010. Two-dimensional, M-mode, color, pulsed and continuous wave Doppler transthoracic echocardiographic examinations were performed with a Sonoline G60 S ultrasound imaging system (Siemens Medical Solutions USA Inc, Malvern, PA, USA) using standard procedures.[12,13] Ethical clearance was obtained for the study from the Ethics and Research Committee of Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Osun State, Nigeria.

Statistical analysis

Continuous variables are expressed as the mean ± standard deviation, with frequency expressed as a percentage. All statistical analyses were performed using the commercially available Statistical Package for the Social Sciences version 15 software (SPSS Inc, Chicago, IL, USA).

Results

Of the 2501 patients included, 1352 (54.06%) were male and 1149 (45.94%) were female, with a male to female ratio of 1.2:1. The mean age was 52.39 ± 17.73 years, with a median and mode of 55 years and 60 years, respectively. Most of the referrals came from the center's cardiology outpatient clinics and adult medical wards, internal medicine, family medicine, surgery, and pediatrics. The clinical indications for echocardiography are shown in Table 1. The most common indication was hypertension (52.1%) followed by congestive cardiac failure (13.9%). Table 2 shows the echocardiographic findings, with the most common diagnosis being hypertensive heart disease (59.4%), with normal findings in 14.1% of subjects. The echocardiographic confirmation rate of clinical diagnoses in Table 3 shows higher sensitivity for hypertensive heart disease, congestive cardiac failure, rheumatic heart disease, and valvular heart disease.

Discussion

The results of this study show that systemic hypertension and its cardiac complications is the most common indication for echocardiography as well as the most common echocardiographic diagnosis at our center. These findings are similar to reports from other hospitals in Nigeria,[3,14,15] where the prevalence of hypertension is high and increasing.[16,17] However, similar research in Enugu reported valvular heart disease to be the most common indication for echocardiography and

Table 1 Clinical indications for echocardiography

Clinical indication	Requests (n)	Percentage
Systemic hypertension	1311	52.1
Congestive cardiac failure	347	13.9
Medical screening	154	6.1
Cerebrovascular disease	88	5
Arrhythmia	87	5
Chest pain	82	3.3
Chronic kidney disease	80	3.2
Congenital heart disease	68	2.6
Cardiomyopathy	46	1.8
Alcoholic heart disease	43	1.7
Rheumatic heart disease	42	1.7
Diabetic mellitus	32	1.3
Thyrotoxic heart (or thyrocardiac) disease	30	1.2
Ischemic heart disease	31	1.2
Pericardial disease	29	1.1
Valvular heart disease	11	0.4
Malignancy (prechemotherapy)	8	0.3
Infective endocarditis	6	0.2
Obstructive uropathy	3	0.1
Peripheral vascular disease	3	0.1
Total	2501	100

Table 2 Echocardiographic diagnoses

Diagnosis	Patients (n)	Percentage
Hypertensive heart disease	1494	59.4
Congestive cardiac failure	401	16.0
Normal study	355	14.1
Rheumatic heart disease	78	3.1
Congenital heart disease	54	2.1
Cardiomyopathy	42	1.7
Pericardial disease	28	1.1
Thyrotoxic heart (or thyrocardiac) disease	14	0.6
Valvular heart disease	12	0.5
Infective endocarditis	3	0.1
Ischemic heart disease	2	0.1
Inconclusive	18	0.7
Total	2501	100

diagnosis, ahead of hypertensive heart disease.[11] This may reflect the fact that there is an active cardiac surgical unit at the hospital in Enugu, thereby attracting more referrals for patients with structural heart disease.[8] Ischemic heart disease was diagnosed in 0.1% of the subjects in our study, with a significant proportion of patients having a normal echocardiogram. This low prevalence is consistent with earlier studies, despite the reported rising incidence of coronary artery disease in developing countries like Nigeria.[18,19] Balogun et al,[3] Ukoh and Omuemu,[14] and Ike[11] reported respective coronary artery disease prevalence rates of 2%, 2.7%, and 0.8%. Thyrotoxic heart disease or thyrocardiac disease[20] was diagnosed in 0.6% of subjects with an echocardiographic confirmation rate of 47%. Thyrocardiac disease refers to thyrotoxic patients with cardiac complications, such as congestive heart failure or persistent cardiac dysrhythmia.[20,21] The concept of thyrotoxic heart disease or thyrocardiac disease was probably first introduced by Levine et al, based on their observations of patients in whom thyrotoxicosis was the major factor leading to cardiomegaly, atrial fibrillation,[22] or congestive heart failure.[23]

Table 3 Echocardiographic confirmation rate of clinical diagnoses

Clinical diagnoses	Requests	Confirmed by echocardiography (n)	Percentage
Systemic hypertension	1311	1494	114
Congestive cardiac failure	347	401	116
Rheumatic heart disease	42	78	186
Congenital heart disease	68	54	79
Cardiomyopathy	46	42	91
Pericardial disease	29	28	97
Thyrotoxic heart (or thyrocardiac) disease	30	14	47
Valvular heart disease	11	12	109
Infective endocarditis	6	3	50
Ischemic heart disease	31	2	6.5

The echocardiographic confirmation rate of clinical diagnoses shows high sensitivity for hypertensive heart disease, congestive cardiac failure, rheumatic heart disease, and valvular disease, as also reported by Kolo et al.[8]

Conclusion

Hypertension was the most common echocardiographic indication in our cardiac care unit, and hypertensive heart disease was the most common echocardiographic diagnosis. Congestive cardiac failure was the next most common indication and echocardiographic diagnosis. Echocardiographic confirmation of clinical diagnoses showed higher sensitivity for hypertensive heart disease and congestive cardiac failure.

Disclosure

This paper was presented at the 36th Annual General and Scientific Meeting of the West African College of Physicians held at the Ghana Institute of Management and Public Administration, Accra, Ghana, held on November 2–8, 2012. Otherwise, the authors report no conflicts of interest in this work.

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