Original Article

Heart Failure and Comorbidities in Patients Evaluated for Cardiovascular Surgery in a Tertiary Hospital in Nigeria

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Abstract

Aims: Heart failure (HF) is a complex clinical syndrome with reduced ability of the heart to pump and/or fill with blood. Acquired and congenital heart diseases (CHDs) are identified structural causes of HF in low- and medium-income countries. **Objectives:** The study aimed to evaluate patients with structural heart disease who were referred for cardiovascular surgery. **Patients, Materials and Methods:** This was a prospective descriptive study of 127 adult patients with structural cardiovascular diseases. A structured questionnaire was administered to them, and biodata and clinical profile were documented. Electrocardiogram, transthoracic echocardiogram, coronary angiogram, and other ancillary tests were done. The diagnosis was made based on clinical findings and results of laboratory investigations. Data were collated and analysed. **Results:** A total of 127 patients, 61 males (48%) and 66 females (52%), presented with features of structural heart diseases. The mean age was 41.39 ± 16.19 years. Rheumatic valve disease was the most common heart lesion (48.8%), followed by CHDs (25.9%). HF was one of the most common comorbidities with most patients in New York Heart Association (NYHA) Class III. **Conclusion:** Rheumatic valve and CHDs were prevalent in this study. HF was a common comorbidity, and most patients were in NYHA class III.

Keywords: Comorbidities, heart failure, New York Heart Association, open heart surgery

Introduction

Heart failure (HF) is a complex clinical syndrome with reduced ability of the heart to pump and/or fill with blood.[1] It is caused by a structural and/or functional cardiac abnormality, resulting in reduced cardiac output and/or elevated intracardiac pressures at rest or during stress.[2] HF is a major health problem affecting about 64.3 million persons globally, with an epidemiology that varies widely within and between countries.[3] Recent studies have put mortality from HF to be highest in Africa (34%), intermediate in southeast Asia (15%), and lowest in China (7%), South America (9%), and the Middle East (9%).[4] The four leading causes of HF in low- and middle-income countries are ischemic heart disease, hypertensive heart disease, cardiomyopathies,[5] and rheumatic heart disease (RHD), and they have been implicated as major causes of HF in Africa.[6] While valvular heart diseases are predominantly caused by RHD in developing countries,[7] degenerative diseases are the main causes in Europe and America.[8] Congenital heart diseases (CHDs) which are significant causes of HF in adults in developed societies[9] have recently been reported to be of high prevalence in African children and adults,[10] thus increasing the burden of structural heart diseases and HF management in our environment. Earlier efforts at developing open heart surgery (OHS) for the management of surgically correctable cardiac lesions in Nigeria were marred by myriad of problems.[11-14] However, with determined efforts of the government, hospital administrations, and foreign partners, there is now a resurgence of OHS in Nigeria. In this study, we evaluated the pattern of HF and comorbidities in patients with structural cardiovascular diseases who presented for cardiovascular surgery at University of Nigeria Teaching Hospital (UNTH), Enugu.

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Patients, Materials and Methods

This was a prospective descriptive pilot study of consecutive patients with structural cardiovascular diseases evaluated at the adult Cardiology Clinic and Wards and referred for surgery at UNTH Enugu, between May 2018 and May 2021. Structured questionnaire was administered to the patients and biodata was obtained. Clinical evaluation was carried out on each patient, and anthropometric parameters such as height (m) and weight (kg) were measured; body mass index (kg/m^2) was calculated. A resting 12-lead surface electrocardiogram (ECG) was done on all enrolled patients in the supine position, at a speed of 25 mm/s, using a Schiller 12-channel automated ECG machine (USA). Analysis of the ECG tracings from each patient was done in the standard fashion, and long lead II tracing served as the rhythm strip. Parameters analysed were heart rate, rhythm, P-wave (duration and shape), height (paroxysmal atrial complexes), PR interval, QRS wave (duration, shape, height, and axis), paroxysmal ventricular complexes, QT interval, QTc, Q-wave, T-wave (shape), ST-segment (shape), and R and S waves for ventricular hypertrophy. Resting two-dimensional echocardiography was carried out on all patients using the GE Vivid iq machine and transducer GE 3Sc RS. M-mode, two-dimensional, pulsed-wave, continuous-wave, tissue Doppler imaging, and color Doppler assessments were carried out on each patient in the left lateral decubitus position. Measurements were taken (in cm) using the American Society of Echocardiography guidelines (leading-edge methodology)[12,15] and structural heart diseases were confirmed. The diagnosis was based on clinical findings, and results of other laboratory investigations including ECG and coronary angiogram. Data obtained were analysed using SPSS version 22 (SPSS inc., Chicago, Illinois, USA) and statistical significance $P \leq 0.05$. Ethical Clearance was obtained from the Ethics and Research Committee of the UNTH, Enugu, while informed consent was obtained from each patient in the study. All information retrieved was kept confidential.

Results

A total of 127 patients, 61 males (48%) and 66 females (52%), presented with features of structural heart diseases and referred for cardiac surgery, with a mean age of 41.39 ± 16.19 years [Table 1]. Most patients were of healthy weight and had lived with symptoms of the diseases for upward of 20 years (91%) [Table 1] and even up to 40 years. Rheumatic valve diseases were the most common heart lesions occurring in 62 patients (48.8%) [Table 2], followed by CHDs in 33 patients (25.9%) [Tables 1 and 3]. Ischemic heart diseases affected mostly the elderly, occurring twice in men as in females [Table 4]. Comorbidities were largely metabolic diseases and HF [Table 1], whereas complications included stroke. Clinical features were mostly due to HF [Table 5], and majority of patients (67) were in New York Heart Association (NYHA) functional class III (52.7%) [Figure 1]. A total of 35 (27.5%) patients enrolled in this study received surgical treatment of different lesions, namely, aortic and mitral valves (22), ventricular septal defect (VSD) (4), atrial septal defect (ASD) (3), patent ductus arteriosus (1), coronary artery bypass graft for CAD (4), and left atrial myxoma

Table 1: Sociodemographic characteristics of the patients

Sociodemographic variables	Frequency (%)
Age (years), mean±SD	41.39±16.19
<20	14 (11.0)
21-30	22 (17.3)
31-40	36 (28.3)
41-50	13 (10.2)
51-60	24 (18.9)
>60	18 (14.2)
Sex	
Male	61 (48.0)
Female	66 (52.0)
Educational level	
Secondary and below	78 (61.4)
Tertiary	49 (38.5)
Marital status	
Single	50 (39.3)
Married	75 (59.0)
Others* (divorced, separated)	2 (1.6)
Religion	
Christianity	122 (96.0)
Moslem	2 (1.6)
Others	3 (2.3)
BMI	
Under-weight	21 (16.5)
Healthy weighty	68 (53.5)
Overweight	30 (23.6)
Obesity	8 (6.3)
NYHA	
2	56 (44.0)
3	67 (52.7)
4	4 (3.1)
Co-morbidity	
None	63 (49.6)
Yes	64 (50.4)
Cardiac (hypertension, congestive cardiac failure, infective endocarditis)	52 (41.0)
CNS (stroke, cerebral abscess)	4 (3.1)
Metabolic (DM, obesity, thyroid disease)	4 (3.1)
Chest (pleural effusion)	1 (0.8)
Marfan's syndrome, dyslipidemia	2 (1.6)
Others	1 (0.8)
Diagnosis	
RHD	62 (48.8)
Degenerative valvular heart disease	7 (5.5)
CHD	33 (25.9)
Others	25 (19.7)
Duration of symptoms (years)	
0-20	117 (92.1)
21-40	9 (7.0)
41-50	1 (0.8)

DM: Diabetes mellitus, CNS: Central nervous system, NYHA: New York Heart Association, BMI: Body mass index, SD: Standard deviation, RHD: Rheumatic heart disease, CHD: Congenital heart disease

Table 2: Distribution of rheumatic valve disease in the study

Rheumatic valve diseases	Frequency		
	Aortic and mitral valves	Predominantly mitral valve	Predominantly aortic valve
Age (years)			
20 and below	1	6	0
21-30	3	10	0
31-40	5	15	2
41-50	5	2	0
51-60	3	5	3
>60	0	1	1
Sex			
Male	7	10	3
Female	10	27	3
Total	17	39	6

Table 3: Distribution of congenital heart diseases in the study

CHDs	Frequency			
	ASD	VSD	TOF	PDA
Age (years)				
20 and below	4	5	0	0
21-30	5	3	2	1
31-40	3	1	4	0
41-50	0	0	0	0
51-60	4	1	0	0
>60	0	0	0	0
Sex				
Male	5	8	2	1
Female	10	2	4	0
Total (%)	16 (48)	10 (30)	6 (18)	1 (3)

ASD: Atrial septal defect, VSD: Ventricular septal defect, TOF: Tetralogy of Fallot, PDA: Patent ductus arteriosus, CHD: Congenital heart disease

(1), respectively. Majority of the patients (33) did well and were discharged home within 10 days. Unfortunately, two of the patients died within the same period, largely due to complications from advanced diseases and severe HF.

Discussion

During the two-year period, 127 patients were recorded and about 4–5 of them with structural cardiovascular diseases needing surgical management were identified and referred for surgery every month. Females constituted 52% of the patients and males made up the remaining 48%. There was no significant difference in the male-to-female ratio [Table 1]. Although the figure does not translate to the number that eventually had OHS, it indicated the number of adult patients that needed OHS in the hospital within the period. It also raised concerns for dedicated cardiovascular evaluation of patients who present with cardiovascular disease (CVS) symptoms that require timely identification and appropriate treatment in our hospitals. This is corroborated by available studies which indicate relatively high number of patients with structural heart diseases that accessed OHS in recent times as shown by data from the Nigeria Heart Registry.[13,16]

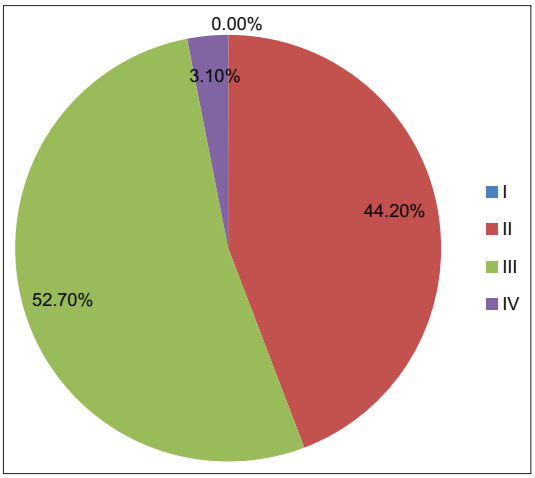

Figure 1: NYHA functional class of participants. NYHA: New York Heart Association

Rheumatic valve disease was the most common heart lesion (48.8%), affecting mostly the mitral valve in the form of regurgitation, followed by the aortic valve. Patients in their third and fourth decades of life as well as females were predominantly affected [Table 2]. Similar findings were reported in other related studies on patients who had OHS in Nigeria[11,13,17] as well as a meta-analysis of RHD in Nigeria.[18] CHDs were prominent among the diseases encountered in these adult patients with ASD being the most common (48%), followed by VSD (30%) [Table 3]. Previous echocardiographic study in the hospital showed predominance of VSD and ASD among adult CHDs.[19] Data from OHS done in another Nigerian hospital showed a significant number of CHD among adult patients who received surgical care.[11] The aortic aneurysm was diagnosed in 11% of the patients, some of them were of Marfan syndrome etiology and at different degrees of dissection [Table 4]. Thirty-five patients (27.5%) enrolled in this study received surgical treatment for the various identified cardiovascular lesions. The low number was attributed to high cost of surgical procedures, brain drain syndrome, and poor infrastructure as identified in a similar study.[12] Other factors that led to a low number of surgical treatment were high mortality arising from worsening HF and comorbidities as some of them stopped keeping clinic appointments and some close relatives reported cases of mortality. This has been reported in similar studies.[20] Some patients, on the other hand, elected to seek surgical treatment in other hospitals offering similar services within and outside the country, this has been documented in a related study.[11]

Comorbidities were prevalent in most of the patients, mainly in the form of hypertension, HF, diabetes mellitus, and other metabolic diseases. They occurred more with increasing age.

Table 4: Other structural heart diseases in the study

Others	Frequency				
	Degenerative valve heart disease	Mitral valve prolapse	Aortic aneurysm with severe AR	Myxoma	Ischeamic heart disease
Age (years)					
20 and below	0	0	0	0	0
21–30	0	0	0	0	0
31–40	0	2	3	0	0
41–50	1	0	3	0	0
51–60	0	1	4	1	1
>60	6	0	4	1	5
Sex					
Male	4	2	12	0	4
Female	3	1	2	2	2
Total	7	3	14	2	6

AR: Aortic regurgitation

Table 5: Common clinical features in the study (*n*=127)

Common clinical features	Frequency, *n* (%)
Exertional dyspnea	100 (78.7)
Palpitation	75 (59)
Leg swelling	65 (51.2)
Cough	64 (50.4)
Chest pain	59 (46.5)
Syncope	14 (11.0)
Clubbing	12 (9.5)
TIA/stroke	10 (7.8)
Cyanosis	1 (0.8)
No symptom	2 (1.6)

TIA: Transient ischemic attack

Data from a similar study in southwest Nigeria identified hypertension as a prominent comorbidity in some of the patients.[17] Hypertension has high prevalence in Nigeria,[21] and increasing age is an identified risk factor[22] that is accompanied by more comorbidities, predisposing patients to worse outcomes.[7] Common clinical features found in most of the patients were exertional breathlessness (78.7%), palpitation (59%), leg swelling (51.2%), and cough (50.4%). When their functional capacity was graded according to NYHA classification, most of the patients (52.7%) were in moderate HF (NYHA III) [Figure 1]. In a related report on open heart surgeries carried out on 26 Nigerians who had RHDs, most of the patients (92.3%) were in NYHA class III/IV.[23] The NYHA classification has been used as a simple but powerful marker of HF severity and observed to relate strongly with known prognostic markers such as peak oxygen consumption (VO2), ventilation/carbon dioxide production slope, and B-type natriuretic peptide (BNP).[24] It has also been employed as one of the parameters in the risk stratification models used for heart surgery patients. The European System for Cardiac Operative Risk Evaluation (EuroSCORE), Society of Thoracic Surgeons score, and Ambler score are some of these risk stratification models.[25] With a combination of indices of functional capacity and cognition, comorbidities and age, some validated risk scoring systems, especially in valvular heart diseases, are helpful in making prognosis in individual patients.[26,27] Clinical evaluation of these patients with the NYHA functional classification is helpful in predicting patient's outcome in surgery and subsequent follow-up. In resource-limited societies such as Nigeria where access to surgical care is constrained by the availability of personnel, facilities, and funds, regular clinical evaluation will help identify patients' new clinical features and mitigate the onset of comorbidities that may portend adverse outcome when surgical care is available. Blood tests for natriuretic peptides such as B-type natriuretic peptide (BNP) and N-terminal pro-B-type natriuretic peptide and cardiac enzymes will aid timely diagnosis and treatment of patients in HF. It will also reduce comorbidities which may affect outcome when surgery is contemplated. Echocardiography will identify structural heart lesions and accurately measure cardiac function, whereas Treadmill ECG and computed tomography angiography will identify patients with CAD and HF that need early revascularization procedures. Furthermore, routine assay for glycated hemoglobin will ensure adequate treatment and normal plasma glucose control which will reduce comorbidities in diabetes patients.

Conclusion

Rheumatic valve and CHDs were the prevalent structural heart diseases in this study. Comorbidities were common in this population, and the class of HF in most patients was NYHA III. The evaluation of patients with structural cardiovascular diseases should include NYHA functional classification.

Limitation

Only limited number of participants evaluated could access surgery because of cost, thus histological diagnosis could not be confirmed in all patients.

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Nil.

Conflicts of interest
There are no conflicts of interest.

References
1. Coronel R, de Groot JR, van Lieshout JJ. Defining heart failure. Cardiovasc Res 2001;50:419-22.
2. Ponikowski P, Voors AA, Anker SD, Bueno H, Cleland JG, Coats AJ, *et al.* 2016 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure: The task force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) developed with the special contribution of the Heart Failure Association (HFA) of the ESC. Eur Heart J 2016;37:2129-200.
3. GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: A systematic analysis for the global burden of disease study 2017. Lancet 2018;392:1789-858.
4. Dokainish H, Teo K, Zhu J, Roy A, AlHabib KF, ElSayed A, *et al.* Global mortality variations in patients with heart failure: Results from the International Congestive Heart Failure (INTER-CHF) prospective cohort study. Lancet Glob Health 2017;5:e665-72.
5. Agbor VN, Ntusi NA, Noubiap JJ. An overview of heart failure in low- and middle-income countries. Cardiovasc Diagn Ther 2020;10:244-51.
6. Dokainish H, Teo K, Zhu J, Roy A, AlHabib KF, ElSayed A, *et al.* Heart failure in Africa, Asia, the Middle East and South America: The INTER-CHF study. Int J Cardiol 2016;204:133-41.
7. Kodali SK, Velagapudi P, Hahn RT, Abbott D, Leon MB. Valvular heart disease in patients ≥80 years of age. J Am Coll Cardiol 2018;71:2058-72.
8. Iung B, Baron G, Butchart EG, Delahaye F, Gohlke-Bärwolf C, Levang OW, *et al.* A prospective survey of patients with valvular heart disease in Europe: The euro heart survey on valvular heart disease. Eur Heart J 2003;24:1231-43.
9. Norozi K, Wessel A, Alpers V, Arnhold JO, Geyer S, Zoege M, *et al.* Incidence and risk distribution of heart failure in adolescents and adults with congenital heart disease after cardiac surgery. Am J Cardiol 2006;97:1238-43.
10. George IO, Frank-Briggs AI. Pattern and clinical presentation of congenital heart diseases in Port-Harcourt. Niger J Med 2009;18:211-4.
11. Falase B, Sanusi M, Majekodunmi A, Animasahun B, Ajose I, Idowu A, *et al.* Open heart surgery in Nigeria; A work in progress. J Cardiothorac Surg 2013;8:6.
12. Eze JC, Ezemba N. Open-heart surgery in Nigeria: Indications and challenges. Tex Heart Inst J 2007;34:8-10.
13. Adebonojo SA. Development of Open Heart Surgery in West Africa; A Historical Perspective. Nigeria: Acecool Medical Publishers; 2012. p. 43-6.
14. Osinaike BB. Open-heart surgery programme in Nigeria: The good, the bad and the ugly. Niger Postgrad Med J 2016;23:104-6.
15. Henry WL, DeMaria A, Gramiak R, King DL, Kisslo JA, Popp RL, *et al.* Report of the American society of echocardiography committee on nomenclature and standards in two-dimensional echocardiography. Circulation 1980;62:212-7.
16. Adult Versus Paediatric Annual Distribution. Nigeria Open-Heart Surgery Registry. Nigeria Heart Registry; 2020. Available from: https://www.nigeriaheartregistry.com»https://www.nigeriaheartregistry.com. [Last accessed on 2021 Jul 06].
17. Salami MA, Akinyemi OA, Adegboye VO. Early results of open-heart surgery for acquired heart diseases in Ibadan, Nigeria. Nig J Cardiol 2018;15:14-9.
18. Ogah OS, Bode-Thomas F, Yilgwan C, Ige O, Ogah F, Ogunkunle OO, *et al.* Rheumatic heart disease in Nigeria: A review. Nig J Cardiol 2020;17:27-36.
19. Ejim E, Anisiuba B, Oguanobi N, Ubani-Ukoma B, Nwaneli U, Ugwu C, *et al.* Congenital heart diseases in adults: A review of echocardiogram records in Enugu, South-East Nigeria. Ann Med Health Sci Res 2014;4:522-5.
20. Omer AC, Vaartjes I, van der Velde ET, de Jong HM, Konings TC, Wagenaar LJ, *et al*. Heart failure admissions in adults with congenital heart disease; risk factors and prognosis. Int J Cardiol 2013;168:2487-93.
21. Adeloye D, Basquill C, Aderemi AV, Thompson JY, Obi FA. An estimate of the prevalence of hypertension in Nigeria: A systematic review and meta-analysis. J Hypertens 2015;33:230-42.
22. Ayogu RN, Ezeh MG, Okafor AM. Prevalence and predictors of different patterns of hypertension among adults aged 20-60 years in rural communities of Southeast Nigeria: A cross-sectional study. Arch Public Health 2021;79:210.
23. Nwiloh JO, Oludara MA, Adebola PA, Edaigbini SA, Danbauchi S, Sowunmi AC. Experience with prosthetic valve replacement in indigents with rheumatic heart disease in Nigeria: 10 years follow-up. World J Cardiovasc Surg 2015;5;75-81.
24. Bredy C, Ministeri M, Kempny A, Alonso-Gonzalez R, Swan L, Uebing A, *et al.* New York Heart Association (NYHA) classification in adults with congenital heart disease: Relation to objective measures of exercise and outcome. Eur Heart J Qual Care Clin Outcomes 2018;4:51-8.
25. Casalino R, Cordeiro de Paula LJ, Martins EB, Tarasoutchi F. Valvular heart disease and risk score systems in clinical practice. EMJ Cardiol 2016;4:103-6.
26. Lee SJ, Lindquist K, Segal MR, Covinsky KE. Development and validation of a prognostic index for 4-year mortality in older adults. JAMA 2006;295:801-8.
27. Vahanian A, Alfieri O, Andreotti F, Antunes MJ, Baron-Esquivias G, Baumgartner H, *et al.* Guidelines on the management of valvular heart disease (version 2012). The joint task force on the management of valvular heart disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS). G Ital Cardiol (Rome) 2013;14:167-214.