

Chronic rheumatic heart disease in Abeokuta, Nigeria: Data from the Abeokuta heart disease registry

Okechukwu S. Ogah, Gail D. Adegbite¹, Sunday B. Udoh¹, Elisha I. Ogbodo, Fisayo Ogah, Adetutu Adesemowo², Oluwatoyin Ogunkunle⁴, Ayodele O. Falase³

Departments of Medicine, Division of Cardiology, ³Chemical Pathology, ⁴Paediatrics, Division of Paediatric Cardiology, University College Hospital, Ibadan, ¹Department of Medicine, Sacred Heart Hospital, Lantoro, Abeokuta, ²Medicine, Federal Medical Centre, Abeokuta, Nigeria

Address for correspondence:

Dr. Okechukwu S. Ogah,
Department of Medicine,
Division of Cardiology,
University College Hospital,
PMB 5116, Ibadan, Nigeria.
E-mail: osogah56156@yahoo.com

ABSTRACT

Background: Rheumatic heart disease (RHD) is a major public health problem in resource-poor countries. According to the World Health Organization (WHO), rheumatic fever (RF)/RHD affects about 15.6 million people worldwide, with 282,000 new cases and 233,000 deaths each year. There are about 2 million people with RHD requiring repeated hospitalization and 1 million likely to require surgery globally.

Objective: The objective of the study is to explore the pattern of RHD in Abeokuta where such a study has not been reported in the past.

Materials and Methods: This is an analysis of a prospectively collected data over a period of 5 years (Jan 2006-Dec 2010). We collected information on the bio-data, clinical features and echocardiographic diagnoses.

Results: During this period, a total of 107 cases of RHD were seen, 66 females (61.7%) and 41 males (38.3%) aged 43.9 ± 19.3 years (range, 7 to 92 years). Mitral regurgitation was the most common lesion (63.6%). Other common lesions include pure mitral stenosis (14.0%), mixed mitral valve disease (6.5%), and mixed mitral and aortic regurgitation (5.6%). Complications of RHD observed included secondary pulmonary hypertension, valvular cardiomyopathy, atrial fibrillation, stroke and infective endocarditis.

Conclusions: Our data show that RHD is an important cause of heart disease in this city although the prevalence is lower than studies done in southern Nigeria in the 60s and 70s. Most present with complications and many do not have access to surgical therapy. There is, therefore, a need for improved surveillance and control of the disease at the community level.

KEY WORDS: Abeokuta, heart disease, Nigeria, rheumatic fever, rheumatic heart disease

Access this article online
Website: www.nigjcardiol.org
DOI: 10.4103/0189-7969.142093
Quick response code


INTRODUCTION

Acute rheumatic fever follows pharyngeal infection with group A b-hemolytic streptococcus or *Streptococcus pyogenes*. Of all the clinical sequelae of this disease, only the cardiac complications progress to chronic complications resulting in heart failure, endocarditis, stroke and death. Although rheumatic fever (RF) and rheumatic heart disease (RHD) are now uncommon in industrialized nations, they are still major causes of morbidity and mortality in developing and resource-poor countries of the world.

Worldwide there are about 15.6 million cases of RF/RHD, with 282,000 new cases and about 233,000 deaths yearly mostly in children and young adults in developing countries.^[1-3] Deaths result from complications associated

with the disease such as infective endocarditis, cardio-embolic stroke, atrial fibrillation, pulmonary hypertension, pregnancy-related complications as well as complications associated with surgery.

RHD is a major cause of non-communicable disease in Africa among children and young adults.^[4-6] The prevalence varies from one country to another and even within the same country. It was responsible for 36% of heart disease in Soweto, South Africa. In Nigeria, the prevalence (based on echocardiography-based registries) ranges from 3.1% to 38.5% depending on the region as well as mode of selection of patients referred for echocardiography.^[7-10]

Recent studies have shown that the prevalence of the disease is falling at least in the southern part of the country.^[11-13] This has been attributed to improvement

in sanitation and housing conditions, increased access to antibiotics for the treatment of sore throat as well as improving primary health care and public health. Sadoh and co-workers recently reported a prevalence of 0.57/1,000 school children in Benin city (mid-western Nigeria).^[13]

In January 2006, a simple cardiac disease registry was established in the two main hospitals in Abeokuta, Nigeria, to define the pattern of heart diseases in the city.

Ethics approval was obtained from the ethics review board of the Federal Medical Centre, Abeokuta, and subjects gave informed written consent.

The pattern and characteristics of RHD has not been explored before in the city. We therefore, used the data from the Abeokuta heart disease registry to examine the characteristics as well as the pattern of RHD.

MATERIALS AND METHODS

This is an analysis of a prospectively collected data over a period of 5 years (January 2006-December 2010). The study was conducted at the Federal Medical Centre, Idi-Aba, Abeokuta and Sacred Heart Hospital, Lantoro, Abeokuta; the main hospitals in the city. Federal Medical Centre, Abeokuta, was established in 1993 by the Federal Government of Nigeria to offer tertiary health care services to the people of Ogun State and environs. Sacred Heart Hospital is one of the oldest hospitals in Nigeria, established in 1897 by the German Catholic mission. The state has a population of about 3.2 million and a land area of about 16,409.26 square kilometers.

The city has a population of about 800,000 inhabitants.^[14]

Clinical evaluation

All the subjects had clinical evaluation, which included history, physical examination, chest X-ray, basic blood investigations, 12-lead electrocardiography and echocardiography.

Echocardiography

The procedure was performed with Aloka SSD 4000 (Aloka Ltd, Tokyo, Japan), which is equipped with 2.5-5 MHz transducer. The standard techniques for depicting the anatomical structures of the heart were employed.^[15,16] All the procedures were performed by a cardiologist (OSO). The reliability of echocardiography measurements at the centre has been previously reported.^[17] All the echocardiography diagnoses were based on standard criteria.^[15,18,19]

Definition of cases

The diagnoses of valvular lesions^[20,21] and chamber quantifications^[22] were based on the recommendations of the American Society of Echocardiography. The complications of RHD were categorized as follows: 1.

Congestive heart failure 2. Infective endocarditis 3. Atrial fibrillation 4. Thrombo-embolic episodes (stroke, pulmonary thrombo-embolism, limb ischemia, etc). LV systolic dysfunction was based on ejection fraction less than 50%. Pulmonary hypertension was based on the presence of elevated pulmonary systolic pressure identified by tricuspid regurgitation jet peak velocity of 35 mmHg or more.^[23]

Data analysis

All the information obtained was entered into a uniform case report form and entered into EpiData Software version 3.1 (EpiData Association, Odense, Denmark). Data were analyzed with SPSS 17.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics was used for the summary of the data. Where applicable Student's *t*-test or analysis of variance were used and a *P*value of <0.05 was assumed to be statistically significant.

RESULTS

Demographic and clinical characteristics

During this period, a total of 107 cases of RHD were seen, 66 females (61.7%) and 41 males (38.3%) aged 43.9 ± 19.3 years (range, 3-92 years, for all, 3-80 yrs for males and 7-92 yrs for females) giving a male-to-female ratio of 1:1.6. Majority (46, 43%) were in the 30-49 age group.

Figure 1 is a histogram showing the age distribution of the subjects. Figure 2 is a line graph showing the presentation of the subjects according to age group. There appears to be peak periods of presentation, at the age group of 10-19 years as well as 30-49 years. More females significantly presented in the age group of 30-49 years while more men presented in the 50-59 years age group.

Majority of them lived in the urban communities, 27 (40.9%) were unemployed and 36 (33.6%) had no formal education. Fifty-four (50.5%) were married. Only five subjects (4.7%) could remember having symptoms suggestive of RF in the past. Nine (8.4%) individuals had been admitted in the past for heart failure. Twelve (11.2%) and two (1.9%) subjects had co-existing high blood pressure and diabetes mellitus, respectively.

Over 70% presented in NYHA class III and IV. Cough, orthopnea, dyspnea on exertion, easy fatigability and leg swelling were the common symptoms. Elevated jugular venous pressure, basal crepitation and displaced apex beat were the common signs [Table 1].

Pattern of valvular lesion

Mitral regurgitation was the most common lesion, 68 (63.6%). Other common lesions include pure mitral stenosis, 15 (14.0%), mixed mitral valve disease, 7 (6.5%), and mixed mitral and aortic regurgitation, 11 (10.2%). One case presented in pregnancy [Figure 3].

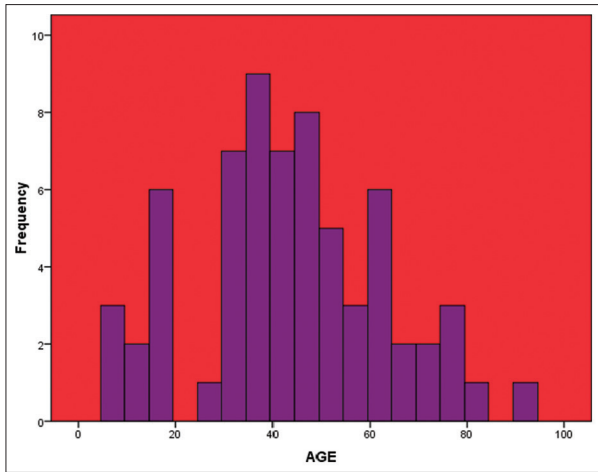


Figure 1: Histogram showing the age distribution of the subjects

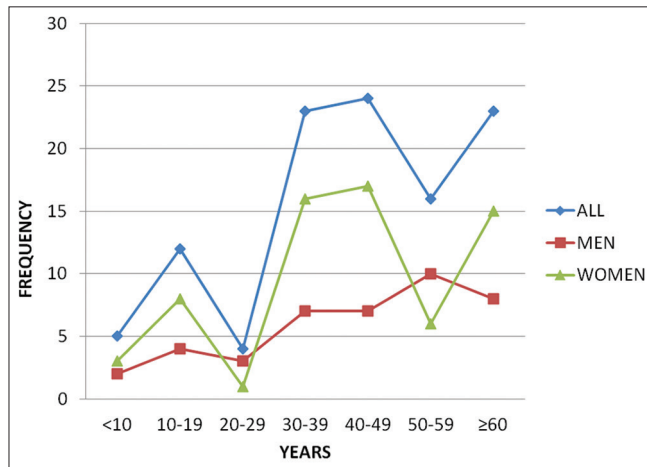


Figure 2: Frequency of valve disease according to gender

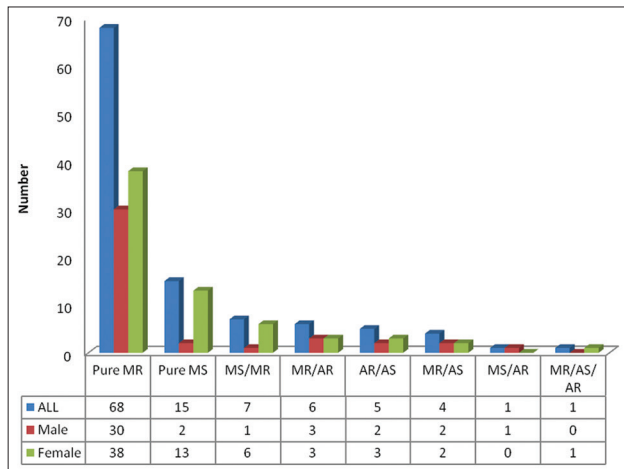


Figure 3: Pattern of valve lesion in the 107 subjects

Table 2 shows the echocardiographic parameters according to the different valve lesions. As expected, subjects with mixed aortic valve lesion have the widest aortic root diameter as well as largest left ventricular (LV) septal and posterior wall thicknesses.

Left atrial diameter was not significantly different in the different groups.

In terms of complications, majority (92, 86%) presented in congestive cardiac failure. Seventeen subjects (15.9%) were in atrial fibrillation, and pulmonary hypertension was present in 58 (54.2%). Stroke and intra-cardiac thrombus were noted in three subjects each (2.8%).

DISCUSSION

This is the first report of the pattern and clinical characteristics of chronic RHD in Abeokuta, Southern Nigeria. In our previous report,^[7] we have documented that RHD constituted about 3.7% of cases in our echocardiography registry and is responsible for 2.4% of disease leading to heart failure in the city.^[24]

A greater majority of our RHD patients were females. This is similar to earlier report by Cole^[25] in the Ibadan Cardiac Disease Registry. Other workers in the country^[26-32] as well as in other parts of Africa^[4,33-35] have reported female preponderance.

The reason for this is not well-known. However, it may be because the disease may run a severe course in males and many of them die before reaching adult age. The health seeking behavior of Africans may also be responsible. In an environment where male children are preferred, it is possible they are taken early to hospital when they have fever and sore throat. Similar to the findings in the Uganda series, more males had formal education than females. More of the females in this study also live in rural areas where housing, sanitation and health care facilities are limited.

A male preponderance, however, has been reported in Pakistan.^[36]

Our data show that RHD is not only a problem of young people but present through all the age groups with a greater proportion presenting after 30 years (after an initial peak in the 10-19 years age group [Figure 2]).

The mean age of our subjects is 43 years (median, 43 years) This is similar to the report from the heart of Soweto study,^[4] where the median age of presentation was also 43 years.

The fact that majority of our subjects are 30 years and above may suggest that milder forms of the disease may be common, which are now manifesting in young age and consequently inadequate antibiotic prophylaxis.

On the contrary, cases reported in the northern part of the country in recent times are relatively younger with

Table 1: Socio-demographic and clinical profile of the 107 subjects

Variable	Male (n=41)	Female (n=66)	Total (n=107)
Mean age (SD) (years)	42.9 (18.8)	43.3 (19.3)	43.1 (19.0)
Age range (years)	3-80	7-92	3-92
Median age (IQR) (years)**	43 (24)	43.2 (27)	42 (25)
Age group (years) (%)*			
<10	2 (4.9)	3 (4.5)	5 (4.7)
10-19	4 (9.8)	7 (10.6)	11 (10.3)
20-29	2 (4.9)	0 (0)	2 (1.9)
30-39	7 (17.1)	16 (24.2)	23 (21.5)
40-49	6 (14.6)	17 (25.8)	23 (21.5)
50-59	12 (29.3)	8 (12.1)	20 (18.7)
≥60	8 (19.5)	15 (22.7)	23 (21.5)
Place of residence* (n/%)			
Urban	41 (100)	53 (80.3)	94 (87.9)
Rural	0 (0.0)	13 (19.7)	13 (12.1)
Occupation (n/%)			
Unemployed	8 (19.5)	19 (28.8)	27 (40.9)
Unskilled labor	24 (58.5)	38 (57.6)	62 (57.9)
Skilled labor	8 (19.5)	10 (15.2)	18 (27.2)
Educational level achieved (n/%)			
No formal education	8 (19.5)	28 (42.4)	36 (33.6)
Primary (6 years)	8 (19.5)	1 (1.5)	9 (8.4)
Secondary (7-12 years)	16 (39.0)	28 (42.4)	44 (41.1)
Tertiary/postgraduate (>12 years)	8 (19.5)	10 (15.2)	18 (16.8)
Marital status (n/%)			
Single	16 (39.0)	19 (28.8)	35 (32.7)
Married	17 (41.5)	37 (56.1)	54 (50.5)
Widow/widower/divorced/separated	8 (19.5)	10 (15.2)	18 (27.2)
Past history of rheumatic fever	1 (2.4)	4 (6.1)	5 (4.7)
Past history of heart failure admission	3 (7.3)	6 (9.1)	9 (8.4)
Family history of heart disease	0 (0.0)	0 (0.0)	0 (0.0)
Never smoked	14 (34.1)	66 (100.0)	80 (74.8)
Never took alcohol	16 (39.0)	55 (83.3)	71 (66.4)
Hypertension	4 (9.8)	8 (12.1)	12 (11.2)
Diabetes mellitus	1 (2.4)	1 (1.5)	2 (1.9)
NYHA class (n/%)			
II	25 (61.0)	3 (4.54)	28 (26.2)
III	16 (39.0)	55 (83.3)	71 (66.4)
IV	0 (0.0)	8 (12.1)	8 (7.5)
Symptoms (n/%)			
Cough	25 (61.0)	59 (89.4)	94 (87.9)
Easy fatigability	25 (61.0)	29 (43.9)	54 (50.5)
Dyspnea	41 (100.0)	66 (100.0)	107 (100)
Orthopnea	41 (100.0)	66 (100.0)	107 (100)
PND	25 (61.0)	55 (83.3)	80 (74.8)
Leg swelling	33 (80.5)	47 (71.2)	80 (74.8)

Contd...

Table 1: Contd...

Variable	Male (n=41)	Female (n=66)	Total (n=107)
Palpitation	0 (0.0)	36 (54.5)	36 (33.6)
Chest pain	25 (60.9)	26 (39.4)	51 (47.7)
Hemoptysis	1 (2.4)	1 (1.5)	3 (2.8)
Fever	2 (4.8)	1 (1.5)	3 (2.8)
Signs (n/%)			
Elevated JVP	25 (61.0)	46 (69.7)	71 (66.4)
Basal crepitation/crackles	33 (80.5)	50 (75.8)	83 (77.6)
Displaced apex beat	16 (39.0)	26 (39.4)	42 (39.3)
Third heart sound (S3)	36 (87.8)	44 (66.7)	80 (74.8)
Systolic murmur*	25 (61.0)	37 (56.1)	62 (58.0)
Diastolic murmur	3 (7.3)	6 (9.1)	9 (8.4)
Tender hepatomegaly	33 (80.5)	47 (71.2)	80 (74.8)
Splenomegaly	3 (7.3)	6 (9.1)	9 (8.4)
Ascites	15 (36.6)	21 (31.8)	36 (33.6)
Respiratory rate (cycles/min) (n/%)			
Pulse rate (beats/min)	85.5 (13.1)	84.6 (14.9)	86.6 (15.3)
Systolic BP (mmHg) - (mean (SD))	119.6 (18.6)	112.8 (19.6)	113.8 (19.0)
Diastolic BP (mmHg) - (mean (SD))	77.7 (15.1)	75.7 (13.5)	76.0 (13.4)
Body mass index (kg/m ²) - (mean (SD))	19.1 (3.4)	24.1 (6.9)	22.3 (6.1)

NYHA – New York Heart Association; JVP – Jugular venous pressure; BP – Blood pressure; SD – Standard deviation

mean age at presentation ranging from 19.5 years to 24 years.^[30,31] Cole^[25] reported a mean age of 24.6 years in his series in Ibadan in 1976.

Over 90% of our patients could not remember having symptoms suggesting RF in the past. This is similar to the findings of Cole^[25] and to a recent report from Uganda.^[34] Previous workers have noted that major signs and symptoms of RF are uncommon in West Africans.

Presentations are often atypical with symptoms of arthralgia and polyarthralgia rather than polyarthritis. Chorea, subcutaneous nodules and erythema marginatum are often rare.^[25-27,29]

Majority of our subjects presented in NYHA classes III and IV. Common symptoms include cough, easy fatigability, dyspnea, orthopnea and paroxysmal nocturnal dyspnea. Non-specific symptoms are less frequent in our series compared to the Ugandan study^[34,37] although they reported similar frequency of NYHA functional class. On the other hand, in the heart of Soweto study,^[4] only 18% were in NYHA classes III and IV.

The late presentation may reflect the level of ignorance in our population, poor health-seeking behavior and sometimes the inability of health workers to detect the disease early.

Table 2: Relation of type of valve lesion to left ventricular structure and function

Parameter	Pure MS (n=15)	Pure MR (n=68)	Mixed MVD (n=7)	Mixed MVD/ AVD (n=12)	Mixed AVD (n=5)	Anova P value
Aortic root diameter	2.33±0.42	2.64±0.48	2.53±0.38	3.02±0.62	3.02±0.48	0.003
Left atrial diameter	5.02±1.36	4.50±1.40	5.34±0.86	4.62±1.20	5.10±1.66	0.352
IVSD	1.00±0.15	1.09±0.29	1.14±0.17	1.40±0.42	1.43±0.36	0.001
LVIDd	4.38±1.14	5.52±1.42	4.47±1.29	5.90±0.93	5.05±1.23	0.015
PWTd	1.13±0.27	1.15±0.61	1.56±0.39	1.38±0.39	1.25±0.35	0.851
IVSs	1.25±0.32	1.46±0.88	1.31±0.14	1.78±0.59	1.85±1.08	0.329
LVIDs	3.33±0.62	3.99±1.51	2.87±1.21	4.28±0.83	3.72±1.46	0.146
PWTs	1.48±0.28	1.61±0.57	1.46±0.20	1.63±0.55	1.70±0.31	0.678
FS	26.1±8.2	32.0±14.9	37.4±9.9	26.6±6.4	31.0±14.1	0.367
EF	53.5±14.5	53.6±20.5	67.6±11.7	45.8±14.0	53.3±20.5	0.317

*IVSD – Interventricular septal wall thickness in diastole; IVSs – Interventricular septal wall thickness in systole; PWTd – Posterior wall thickness in diastole; PWTs – Posterior wall thickness in systole; LVIDd – Left ventricular internal diameter in diastole; LVIDs – Left ventricular internal diameter in systole; FS – Fractional shortening; EF – Ejection fraction; MVD – Mitral valve disease; AVD – Aortic valve disease

The most common form of valve lesion in our series is mitral regurgitation and mixed mitral or aortic valve disease.

This is similar to the findings of other workers in different parts of Nigeria^[25,26,28-30,32,38] and other parts of Africa.^[4,34,37,39] The reason for left-sided predominance is not fully understood but some workers attribute this to the dominance of the left heart.

Repeated or persistent rheumatic activity may be responsible for disease progression and predominance of valvular regurgitation lesions.

Majority of the patients had moderate to severe disease. This finding brings to the fore the need for community screening of mild diseases who will benefit from antibiotic prophylaxis.

Heart failure is the most common complication noted in our series and is the major reason for presenting in the hospital [Table 3]. The mean LV ejection fraction ranged from 45.8% in those with mixed mitral or aortic valve disease to 67.6% in those with mixed mitral valve disease. Of note is the high frequency of pulmonary hypertension in our series, which was present in 58 cases (54.2%). This could be due to the degree of left atrial dilation in our subjects. Similar finding was reported by Cole in Ibadan, Nigeria^[25] and from Uganda.^[34] Atrial fibrillation was seen in 15.9% while stroke and intra-cardiac thrombus was noted in 3 cases each (2.8%). This is lower than the rate reported by previous authors in Nigeria.^[30,40]

Study limitation

This is a hospital-based study and therefore limited by the fact we have described those who have been able to present to our health facility and by extension those who have advanced disease. Mild cases in the community have not been captured in this study. Clinical approach alone was used in classifying our cases as there are no gold standard methods for categorizing valvular

Table 3: Spectrum of complications in the 107 subjects

Complications	Frequency (%)
Heart failure	92 (86%)
Stroke	3 (2.8)
Atrial fibrillation	17 (15.9%)
Intra-cardiac thrombus	3 (2.8)
Pulmonary hypertension	58 (54.2)

heart diseases. This method is fraught with bias in classification of valvular lesions.

CONCLUSIONS

Our data show that RHD is an important cause of heart disease in this city although the prevalence is lower than studies done in southern Nigeria in the 60s and 70s. Most present with complications and many do not have access to surgical therapy. There is therefore an urgent need to implement the program of the Drakensberg declaration^[41] in order to stem the scourge of this disease in Abeokuta in particular and Nigeria in general.

REFERENCES

- Marijon E, Mirabel M, Celermajer DS, Jouven X. Rheumatic heart disease. *Lancet* 2012;379:953-64.
- Reményi B, Wilson N, Steer A, Ferreira B, Kado J, Kumar K, *et al.* World Heart Federation criteria for echocardiographic diagnosis of rheumatic heart disease—an evidence-based guideline. *Nat Rev Cardiol* 2012;9:297-309.
- Carapetis JR, Steer AC, Mulholland EK, Weber M. The global burden of group A streptococcal diseases. *Lancet Infect Dis* 2005;5:685-94.
- Sliwa K, Carrington M, Mayosi BM, Zigiriadis E, Mvungi R, Stewart S. Incidence and characteristics of newly diagnosed rheumatic heart disease in urban African adults: Insights from the heart of Soweto study. *Eur Heart J* 2010;31:719-27.
- Mocumbi AO, Sliwa K. Women's cardiovascular health in Africa. *Heart* 2012;98:450-5.
- Sliwa K, Mocumbi AO. Forgotten cardiovascular diseases in Africa. *Clin Res Cardiol* 2010;99:65-74.
- Ogah OS, Adegbite GD, Akinyemi RO, Adesina JO, Alabi AA, Udofia OI, *et al.* Spectrum of heart diseases in a new cardiac service

- in Nigeria: An echocardiographic study of 1441 subjects in Abeokuta. *BMC Res Notes* 2008;1:98.
8. Ike SO. Echocardiographic analysis of valvular heart diseases over one decade in Nigeria. *Trans R Soc Trop Med Hyg* 2008;102:1214-8.
 9. Adebayo RA, Akinwusi PO, Balogun MO, Akintomide AO, Adeyeye VO, Abiodun OO, *et al.* 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. *Int J Gen Med* 2013;6:541-4.
 10. James OO, Efosa JD, Romokeme AM, Zuobemi A, Sotonye DM. Dominance of hypertensive heart disease in a tertiary hospital in southern Nigeria: An echocardiographic study. *Ethn Dis* 2012;22:136-9.
 11. Akinwusi PO, Peter JO, Oyedeji AT, Odeyemi AO. The new face of rheumatic heart disease in South West Nigeria. *Int J Gen Med* 2013;6:375-81.
 12. Ogah OS, Stewart S, Falase AO, Akinyemi JO, Adegbite GD, Alabi AA, *et al.* Contemporary profile of acute heart failure in Southern Nigeria: Data from the abeokuta heart failure clinical registry. *JACC Heart Fail* 2014;2:250-9.
 13. Sadoh WE, Omuemu VO, Israel-Aina YT. Prevalence of rheumatic heart disease among primary school pupils in mid-western Nigeria. *East Afr Med J* 2013;90:21-5.
 14. Nigerian National Population Census. 2006. Available from: <http://www.population.gov.ng/index.php/censuses> [Last accessed on Jun 10].
 15. Sahn DJ, DeMaria A, Kisslo J, Weyman A. Recommendations regarding quantitation in M-mode echocardiography: Results of a survey of echocardiographic measurements. *Circulation* 1978;58:1072-83.
 16. 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.
 17. Ogah OS, Adebajo AT, Otukoya AS, Jagusa TJ. "Echocardiography in Nigeria: Use, problems, reproducibility and potentials". *Cardiovasc Ultrasound* 2006;4:13.
 18. Quinones MA, Otto CM, Stoddard M, Waggoner A, Zoghbi WA. Doppler Quantification Task Force of the Nomenclature and Standards Committee of the American Society of Echocardiography. Recommendations for quantification of Doppler echocardiography: A report from the Doppler Quantification Task Force of the Nomenclature and Standards Committee of the American Society of Echocardiography. *J Am Soc Echocardiogr* 2002;15:167-84.
 19. Otto CM. Valvular stenosis and valvular regurgitation. In: Otto CM, editor. *Textbook of Clinical Echocardiography*. 3rd ed. Elsevier Saunders; Vol 1 2004.
 20. Baumgartner H, Hung J, Bermejo J, Chambers JB, Evangelista A, Griffin BP, *et al.* Echocardiographic assessment of valve stenosis: EAE/ASE recommendations for clinical practice. *J Am Soc Echocardiogr* 2009;22:1-23.
 21. Zoghbi WA, Enriquez-Sarano M, Foster E, Grayburn PA, Kraft CD, Levine RA, *et al.* American Society of Echocardiography. Recommendations for evaluation of the severity of native valvular regurgitation with two-dimensional and Doppler echocardiography. *J Am Soc Echocardiogr* 2003;16:777-802.
 22. Lang RM, Bierig M, Devereux RB, Flachskampf FA, Foster E, Pellikka PA, *et al.* Recommendations for chamber quantification: A report from the American Society of Echocardiography's Guidelines and Standards Committee and the Chamber Quantification Writing Group, developed in conjunction with the European Association of Echocardiography, a branch of the European Society of Cardiology. *J Am Soc Echocardiogr* 2005;18:1440-63.
 23. Rudski LG, Lai WW, Afilalo J, Hua L, Handschumacher MD, Chandrasekaran K, *et al.* Guidelines for the echocardiographic assessment of the right heart in adults: A report from the American Society of Echocardiography endorsed by the European Association of Echocardiography, a registered branch of the European Society of Cardiology, and the Canadian Society of Echocardiography. *J Am Soc Echocardiogr* 2010;23:685-713, quiz 786-688.
 24. Ogah O, Adegbite G, Akinyemi R, Adesina J, Alabi A, Falase A, *et al.* Epidemiology of acute heart failure in Southern Nigeria: Data from the abeokuta heart failure registry. *Circulation* 2010;122:e229.
 25. Cole TO. Rheumatic fever and rheumatic heart disease in the tropics with particular reference to Nigeria. *Niger Med J* 1976;6:123-6.
 26. Jaiyesimi F, Antia AU. Childhood rheumatic heart disease in Nigeria. *Trop Geogr Med* 1981;33:8-13.
 27. Antia AU, Effiong CE, Dawodu AH. The pattern of acquired heart disease in Nigerian children. *Afr J Med Sci* 1972;3:1-12.
 28. Ogunbi O, Fadahunsi HO, Ahmed I, Animashaun A, Daniel SO, Onuoha DU, *et al.* An epidemiological study of rheumatic fever and rheumatic heart disease in Lagos. *J Epidemiol Community Health* 1978;32:68-71.
 29. Fadahunsi HO, Coker AO, Usoro PD. Rheumatic heart disease in Nigerian children: Clinical and preventive aspects. *Ann Trop Paediatr* 1987;7:54-8.
 30. Sani MU, Karaye KM, Borodo MM. Prevalence and pattern of rheumatic heart disease in the Nigerian savannah: An echocardiographic study. *Cardiovasc J Afr* 2007;18:295-9.
 31. Onwuchekwa AC, Ugwu EC. Pattern of rheumatic heart disease in adults in Maiduguri-north east Nigeria. *Trop Doct* 1996;26:67-9.
 32. Essien IO, Onwubere BJ, Anisiuba BC, Ejim EC, Andy JJ, Ike SO. One year echocardiographic study of rheumatic heart disease at Enugu, Nigeria. *Niger Postgrad Med J* 2008;15:175-8.
 33. Beaton A, Okello E, Lwabi P, Mondo C, McCarter R, Sable C. Echocardiography screening for rheumatic heart disease in Ugandan schoolchildren. *Circulation* 2012;125:3127-32.
 34. Zhang W, Mondo C, Okello E, Musoke C, Kakande B, Nyakoojo W, *et al.* Presenting features of newly diagnosed rheumatic heart disease patients in Mulago Hospital: A pilot study. *Cardiovasc J Afr* 2013;24:28-33.
 35. Tantchou Tchoumi JC, Butera G. Rheumatic valvulopathies occurrence, pattern and follow-up in rural area: The experience of the Shisong Hospital, Cameroon. *Bull Soc Pathol Exot* 2009;102:155-8.
 36. Aurakzai HA, Hameed S, Shahbaz A, Gohar S, Qureshi M, Khan H, *et al.* Echocardiographic profile of rheumatic heart disease at a tertiary cardiac centre. *J Ayub Med Coll Abbottabad* 2009;21:122-6.
 37. Okello E, Wanzhu Z, Musoke C, Twalib A, Kakande B, Lwabi P, *et al.* Cardiovascular complications in newly diagnosed rheumatic heart disease patients at Mulago Hospital, Uganda. *Cardiovasc J Afr* 2013;24:80-5.
 38. Carlisle R, Ogunlesi TO. Prospective study of adult cases presenting at the Cardiac Unit, University College Hospital, Ibadan 1968 and 1969. *Afr J Med Sci* 1972;3:13-25.
 39. Maru M. The changing pattern of cardiovascular diseases in Ethiopia. *East Afr Med J* 1993;70:772-6.
 40. Cole TO. Pattern of rheumatic heart disease in Nigerians. *Trop Cardiol* 1980;6:69.
 41. Mayosi B, Robertson K, Volmink J, Adebajo W, Akinyemi K, Amoah A, *et al.* The Drakensberg declaration on the control of rheumatic fever and rheumatic heart disease in Africa. *S Afr Med J* 2006;96 (3 Pt 2):246.

How to cite this article: Ogah OS, Adegbite GD, Udoh SB, Ogbodo EI, Ogah F, Adesemowo A, *et al.* Chronic rheumatic heart disease in Abeokuta, Nigeria: Data from the Abeokuta heart disease registry. *Nig J Cardiol* 2014;11:98-103.

Source of Support: Nil, **Conflict of Interest:** None declared.