Original Article

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

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## 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

## 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].

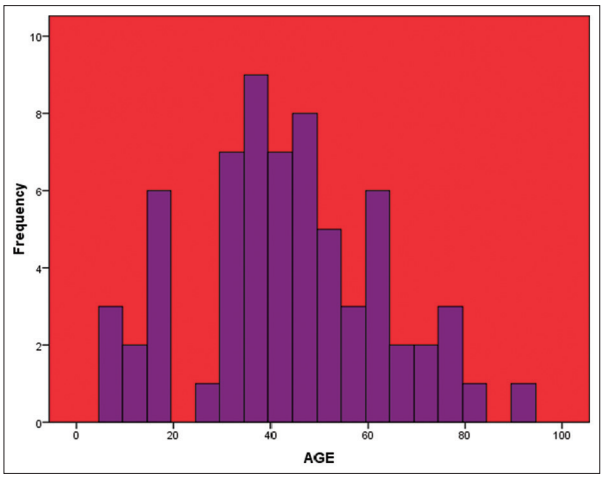



**Figure 1:** Histogram showing the age distribution of the subjects

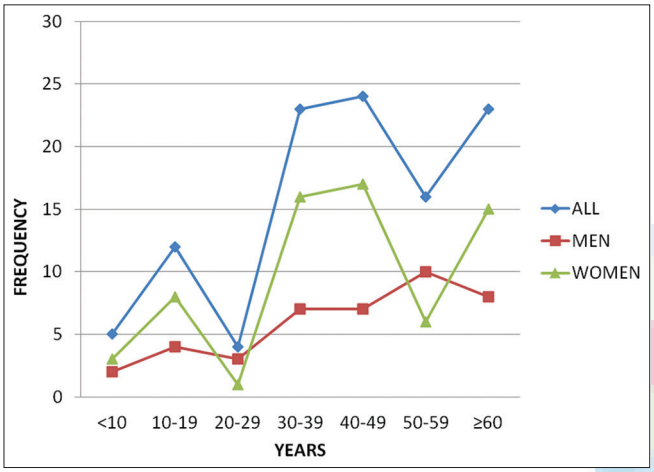
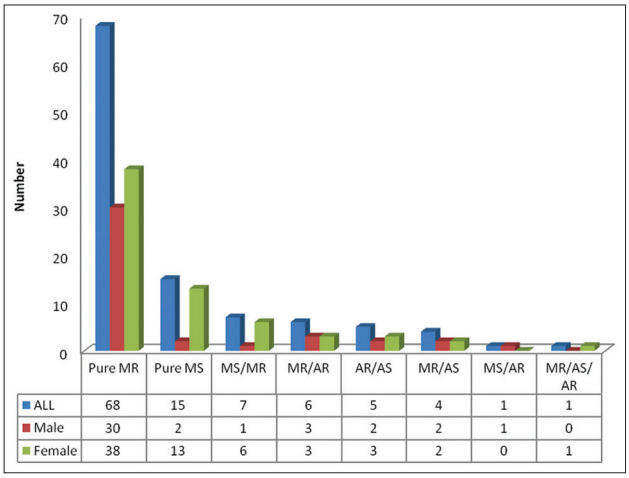



**Figure 2:** Frequency of valve disease according to gender




| | Pure MR | Pure MS | MS/MR | MR/AR | AR/AS | MR/AS | MS/AR | MR/AS/AR |
|---|---|---|---|---|---|---|---|---|
| ALL | 68 | 15 | 7 | 6 | 5 | 4 | 1 | 1 |
| Male | 30 | 2 | 1 | 3 | 2 | 2 | 1 | 0 |
| Female | 38 | 13 | 6 | 3 | 3 | 2 | 0 | 1 |

**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 adult age. It may also suggest poor detection 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) |
| 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*/%) | | | 27 (6.0) |
| 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/m2) - (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 polyarthalgia 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 diastole; 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 heart diseases. This method is fraught with bias in classification of valvular lesions.

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) |

## 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.

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