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PREVALENCE OF RHEUMATIC HEART DISEASE AMONG PRIMARY SCHOOL PUPILS IN MID-WESTERN NIGERIA

W. E. SADOH, V. O. OMUEMU and Y. T. ISRAEL-AINA

ABSTRACT

***Objective*: To determine the prevalence of RHD among primary school pupils in Egor Local Government Area (LGA) of Edo State of Nigeria.**
***Design*: A cross sectional study**
***Setting*: The study was carried out among selected primary pupils in three public and six private schools in Egor LGA, (the smallest governmental unit) in mid-Western Nigeria.**
***Subjects*: Using a multistage sampling technique, pupils were selected from public and private primary schools in Egor LGA. They were clinically screened for evidence of RHD by auscultating for significant murmurs. The pupils with significant murmurs then had echocardiographic evaluation to confirm the presence of RHD.**
***Main outcomes*: Pupils with significant murmurs and pupils with echocardiographically confirmed RHD.**
***Results*: Of the 1764 pupils recruited, 900 (51.02%) were females while 864 (48.98%) were males. The mean age of the pupils was 8.86 ± 2.14 years. 1065(60.37%) and 699(39.63%) respectively were recruited from public and private schools. Of the 1764 pupils, six (0.34 %) had significant murmur. Only one of the six had RHD, giving a prevalence of 0.57/1000 pupils. The pupil with RHD was a male, from public school and in the low socioeconomic class.**
***Conclusion*: The prevalence of RHD in this study is low compared to similar studies conducted outside the country. The true prevalence may be underestimated since higher prevalence is obtained from echocardiographic based screening compared to clinical screening.**

INTRODUCTION

Rheumatic heart disease (RHD) is the chronic sequala of rheumatic fever (RF) (1). It is often the outcome of repeated RF infections (1,2). Rheumatic fever in turn is the non suppurative sequala of group A β haemolytic streptococcal upper respiratory tract infection due to delayed immune reactions (2). Rheumatic fever and RHD are of public health importance being major causes of acquired heart diseases in the developing countries (3-5).

The World Health Organisation (WHO) estimated that 16 million people suffer from RHD in the world (6). The RHD and RF burden is highest in the developing countries accounting for 90% of the global burden of RF/RHD. These diseases have reduced considerably or have practically been eliminated in the developed countries. The success had been ascribed to improved living conditions, environmental sanitation and access to improved healthcare (7).

The repeated episodes of RF lead to the onset of RHD or worsen the severity of an existing RHD. Thus if the RF is prevented from reoccurring in individuals with previous RF or one with RHD, the burden of RHD can be reduced substantially in the patients, their families and the country at large (8,9). This concept is embedded in the secondary prevention programme of RF. The administration of depot preparation of benzythine penincillin for three to four weekly has been shown to be successful in preventing recurrent episodes of RF (9). An individual with RHD has to be diagnosed with the condition before this preventive measures can be instituted. Whereas the diagnosis of RF seems uncommonly made in most clinics in developing countries as might be suggested by the paucity of studies on RF in the developing countries, the continued reports from studies on RHD, (5,10)

the sequala of RF would suggest otherwise. The high RHD burden will increase the cost of healthcare and economic burden both to the individual and the community.1 The last and only school based screening for RHD in Nigeria was conducted in Lagos, Nigeria in 1978 (11). The prevalence of RHD was 0.08/1000 primary school pupils using auscultatory method. There are no recent data on the disease prevalence. However there are hospital based studies on RHD and this may not reflect the true burden of the disease in the community (5,9,10).

It is therefore imperative to educate patients with RF to have antibiotic prophylaxis to prevent recurrent attacks of RF. More importantly, identifying patients who already have RHD in the community especially those with mild cases and the commencement of prophylaxis in these patients will prevent recurrent attacks of RF and may halt the progression of the disease process. This study is therefore carried out to determine the prevalence of RHD among primary school pupils in Egor Local Governement Area of Edo State, in Mid-Western Nigeria.

MATERIALS AND METHODS

This cross sectional study was conducted in Egor LGA, one of the three LGAs in Benin City, in Edo state of Nigeria. It has an estimated total population of 339,899 (12). It is predominantly an urban setting with ten political wards of which two are rural. Egor LGA was chosen because it is representative of the other LGAs in terms of demography and social class. This study was conducted over a six months period (September 2011 to February 2012). This period included the times the schools were in session. Ethical approval for this study was obtained from the ethics committee of the University of Benin Teaching Hospital.

Sampling technique: A sample size of 1760 pupils was selected using a multi stage sampling technique. Of the ten political wards, 30% (3) wards were randomly selected from a list of the political wards as the first stage sampling process. There were eight public and 19 private schools in the three selected wards from which 30% each of private and public schools were selected from a list of alphabetically arranged schools. Thus three public and six private schools were selected using a systematic sampling technique after randomly selecting the first school (second stage). The school sample size was determined as the ratio of the product of index school population and study sample size (1760) over the pooled population of the nine selected schools. The school sample size was thus determined in proportion to school population. A systematic sampling method was employed to select pupils from each school.

Evaluation of selected pupils: An informed consent was obtained from the parents of each selected pupil. Any child whose parent declined to give consent was replaced by the next pupil on the list, selected using the sampling interval and whose parent gave consent. A socioeconomic class was ascribed to each selected pupil using the method described by Olusanya *et al*. (13). The selected pupil then had a thorough general and systemic examination with emphasis on the cardiovascular system. The weight was taken with the shoes, wrist watches, belts and other thick clothing taken off and the subject was in his or her school uniform only. The Omron body composition monitor (BF511Netherlands) was employed to measure the weight. The pupils were instructed to stand on the weighing machine looking ahead. The weight once captured was displayed on the machine. The weight was read to the nearest 0.1 kg. The height was taken with the aid of a standiometer with the pupils' shoes and stockings off, the pupils were instructed to stand against the standiometer with the heels, buttocks and occiput resting against the standiometer. The chin was raised as the subject was looking ahead with the upper border of the ear canal in the same horizontal plane as the lower border of their eye socket (Frankfurt plane). The height was read to the nearest 0.1 cm.

In auscultating the pupils' heart, all the cardiac areas (apical, tricuspid, pulmonary and aortic areas were listened to for abnormal sounds. Particular attention was paid to the presence of apical pansystolic murmur that radiates to the axilla which suggests the presence of mitral regurgitation, or basal early diastolic murmur of aortic regurgitation. Apical diastolic murmur and basal systolic murmurs were listened for as well. Any other murmur was also evaluated. Auscultation was done by authors and a team of five senior registrars. Each murmur heard was re-evaluated by one of the researcher who is a Paediatric Cardiologist. Any other abnormality found during the general and systemic examination was noted.

Echocardiographic examination: Every subject with suspected RHD murmur on clinical evaluation was taken to the Tertiary centre within the LGA for an echocardiogram by one of the authors WES (Paediatric Cardiologist). Parental consent was once sought before the procedure could be done. The echocardiogram was done with Aloka 4500 P Sonograms systems. The interrogation was performed from the apical four chamber view, long axis parasternal and short axis parasternal views. Two dimensional echocardiography (2D), M-mode, pulsed and continous wave and colour Doppler techniques were used. The structure of the intrcardiac valves particularly the mitral and aortic were evaluated with respect to the presence of thickening and deformity

such as the elbow or bent knee appearance of the mitral valve leaflets. The evidence of valvular incompetence or stenosis was noted. Where there was regurgitation, the length of the regurgitant jet was measured. The function of the heart was evaluated with the value of fractional shortening and ejection fraction (14,15). The 2006 WHO echocardiographic criteria16 for case definition of RHD was used. The RHD cases are classified into definite, probable or possible RHD.

Statistical analysis: The data were entered into SPSS version 16 (Chicago IL) spread sheet and analysis done with the tool. Values were presented as percentages while the prevalence of RHD was presented as number of affected pupils / 1000 pupils. Differences in means were compared using student's t test. More than two means were compared using one-way ANOVA with Turkey Kramer post hoc test when significant. Level of significance was set at p = <0.05.

RESULTS

Characteristics of the study population: The recruited 1764 children were aged five to fifteen years with a mean age of 8.86 ± 2.14 years. Majority of the pupils 1124 (63.70%) were in the age group five to nine years of age while the others 640 (36.30 %) were in the age group ten to fifteen years. Majority of the pupils 900(51.02%) were females while 864(48.98%) were males. There were 1065(60.37%) pupils from public schools while 699(39.63%) were from private schools. Most of the pupils 1722 (97.62%) had enough information to compute their SEC. Over half of these pupils 937(54.41%) were from the low SEC, 491(28.51%) were in the high SEC and the least 294(17.08%) were in the middle SEC. The characteristics of the study population with respect to the type of school are shown in Table 1. The mean number of pupils per class in public school 57.33 ± 5.20 was significantly more than those in private schools 29.56 ± 3.43, p = <0.0001, (CI: -28.21 to -27.33).

The mean weight of the pupils in the public and private schools were 28.19 ± 7.51 and 29.63 ± 8.58 kg respectively, p = <0.0001, Confidence interval (CI) -1.84 to -1.44. The mean weight of the female and male pupils were 29.18 ± 8.65 kg and 28.51 ± 7.35 kg respectively, P = 0.08. The mean height of the male and female pupils were 130.31 ± 9.90 cm and 130.65 ± 10.65 cm, p = 0.488. The pupils in private schools were taller 130.67 ± 9.74 cm than those in public schools 130.32 ± 10.74, P = 0.52.

Table 1
Characteristics of study population

Characteristics	Public schools	Private schools	P value	Confidence Interval
Mean age (years)	9.72 ± 2.25	8.08 ± 1.76	<0.0001	-1.84 to -1.44
Mean no pupils/class	57.33 ± 5.20	29.56 3.43	<0.0001	-28.21 to -27.33
Gender				
Males	533(50.05)	331(47.35)	0.31	
Females	532(49.95)	368(52.65)		
Socioeconomic class				
High	15(1.45)	476(68.98)		
Middle	161(15.60)	133(19.28)	0.001	
Low	856(82.95)	81(11.74)		

The prevalence of the rheumatic heart disease in the study population: Of the 1764 pupils screened clinically for evidence of RHD, six (0.34 %) had significant heart murmurs. Of these only one (16.67 %) had echocardiographic evidence of RHD. The prevalence of RHD in the study population is thus 1/1764 = 0.57/ 1000 pupils. The pupil with RHD is an 11 year old male with mitral regurgitation, the regurgitant jet was eccentric and measured 27mm (See Fig I). The anterior mitral valve leaflet was thickened. The child thus had definite RHD according to WHO RHD case definition. The pupil with RHD is from low SEC and is in a public school. The pupil was unaware of the condition and could not remember having pharyngitis.

Other findings: There were 12 (0.68 %) pupils in the study population who had pallor clinically. They were all from public schools. Fifteen (0.85 %) had Taenia capitis, and of these, 14(93.33%) were in the public school while one (06.67 %) was in private school. One (0.06 %) each of the pupils had features of achondroplasia, torrencephaly and scabes.

DISCUSSION

The prevalence of RHD in this study is slightly higher than the 0.08/1000 obtained in a study by Ogunbi et al in Lagos in 1978 (11). The difference may have been due to the methodology. In the Lagos study, the clinical evaluation of heart murmur was conducted by medical students who may not be as competent as a team of senior residents and cardiologist who did the clinical evaluation in the present study. It is possible that some patients who do not have loud murmurs may have been missed.

The prevalence obtained in this study is far lower than the values obtained in some other developing countries where similar methodology was used. In a study conducted among primary school pupils aged five to fifteen years in Sudan, (17) the prevalence of RHD was 11/ 1000 pupils. In studies done in Kinshasa (18) and Addis Ababa (19) in 1998 and 1999 respectively, on school children aged five to sixteen years the prevalence were 14.03/1000 and 6.4/1000 children respectively. The higher values obtained in these African countries compared to the present study may be due to prevailing poor socioeconomic circumstances in those countries at the time of the study. The relatively high values were attributed largely to overcrowded living conditions and poor socioeconomic background.

Some studies outside of Africa have also demonstrated a higher prevalence of RHD compared to the present study. In two studies conducted in Rahim Yaar Khan (20) and Lahore (21) both districts in Parkistan in 2004 and 2009 respectively, RHD was identified in 5.7/ 1000 and 21.9/ 1000 in school children aged five to fifteen years. Both studies have higher RHD prevalence than the present study and suspected cases on clinical examination were confirmed on echocardiography. The Rahim Yaar Khan study conducted in a periurban setting did not find any relationship between the prevalence and well known determinants of RHD such as education, overcrowding and SEC. The Lahore study however was conducted in rural slums with widespread poverty and overcrowding. This might explain the wide difference in the prevalence of RHD in the two districts of the same country. The difference in prevalence also suggests that the prevalence of RHD do not only vary between countries, but also within the same country based on the prevailing socioeconomic and environmental situation of the studied community.

Although the prevalence in the present study is higher than the one conducted 33 years ago in the Lagos Nigeria,11 both values are however quite low representing < 1/1000 pupils. The very low values obtained in this study compared to the values in other countries, may have been due to improve standard of living as shown by the rising gross domestic product (GDP) of the country in the last decade (22). This would translate to improved housing condition, access to healthcare and improvement in environmental sanitation occasioned by the recurring environmental sanitation programmes of various state governments of the studied communities. These factors singly or in combination may have contributed to the low prevalence. These socioeconomic and environmental factors have been identified as responsible for the reduction of the burden of RHD in previous studies (8,19).

This is the second community based study on the prevalence of RHD in Nigeria to the best of the investigator's knowledge. The first being the study by Ogunbi *et al (*11) in Lagos. The study represents the current RHD prevalence in Egor local government area. Indirect evidence to support the prevalence is seen in the study conducted on streptococcal throat carriage amongst primary school pupils in 1999 in the same Local Government Area (23). There was no case of group A β haemolytic streptococcus, the organism responsible for the causation of rheumatic fever and RHD. Group A streptococcal throat carriage reflects the burden of RF/RHD burden in the same locality and thus becomes a tool for indirectly assessing the burden of RHD in the same locality (24).

The pupil with RHD in the present study was unaware of the condition and thus was not accessing the very important penicillin prophylaxis for preventing recurrent episodes of RF which may worsen and cause the condition to deteriorate. The lack of awareness of the RHD condition by affected children has similarly been reported in a previous study (17). This calls attention to the need to identify these children with RHD early and follow them up with penicillin prophylaxis and regular evaluation of the state of the affected valve.

The prevalence obtained in this study was from echocardiographic confirmation of suspected cases on clinical evaluation. Previous study using echocardiogrphic screening of study participants have revealed a higher RHD prevalence with this method than clinical screening. In a multicentre study conducted in Cambodia and Mozambique, (25) he prevalence of RHD on echocardiographic screening was ten times higher than clinical screening. This suggests that had the present study been conducted by echocardiographic screening, the prevalence might have been higher. The reason for the estimated higher prevalence is the detection of the subclinical forms of RHD. The advantage of detecting the subclinical cases is that opportunity is provided for early follow up and such cases are prevented from deteriorating into the severe forms that are more difficult and expensive to manage. It is however important to identify any child with RHD whether clinical or subclinical and initiate therapy and follow up.

The difficulty with carrying out echocardiographic screening in resource limited setting like ours is that

the echocardiography machine is expensive to procure and the machine requires an expert to operate for reliable results. Although there is a study (26) in which medical students were taught to operate portable echocardiography machines to screen children at risk, the absence of RHD cases in the population screened makes it difficult to fully evaluate the ability of the students to detect RHD using echo.

In conclusion, it can be inferred that the burden of RHD amongst primary school pupils in the present study is low. Similar studies done in different parts of the country or better still, studies employing echocardiographic screening will provide a better country representative prevalence.

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