ORIGINAL RESEARCH

URINARY SCHISTOSOMIASIS AMONG CHILDREN AND TEENAGERS NEAR OYAN DAM, ABEOKUTA, NIGERIA

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ABSTRACT

Objectives: Studies were carried out to determine the status of urinary schistosomiasis among pre-school and school-aged children in three communities around Oyan dam, South Western Nigeria. Methods: A cross-sectional study was conducted in 2009. Urine samples were collected and investigated for the presence of microhaematuria using the Medi-Test Combi 9 reagent strip. Urine was also microscopically examined. Results: Of 120 urine samples collected at Ibaro-Oyan, Abule Titun and Abule Sikiru communities, both Medi-Test Combi 9 reagent strip and microscopy revealed prevalences were 66.7% (95% confidence interval: 57.5 to 75.0) and 71.7% (95%-CI: 62.7 to 79.5), respectively. There was no significant difference in infection rates between sexes, although rates were slightly higher in females. Overall, infection rates increased with age (microhaematuria: p=0.030; *S. haematobium* eggs: p=0.006). Conclusions: The results indicate that the communities around Oyan dam were still endemic with schistosomiasis and that there is an urgent need for mass drug distribution and public health education in curbing the disease in the study area. Moreover, the provision of basic public health facilities such as functional boreholes, electricity and a reliable waste disposal system is likely to decrease prevalence of schistosomiasis in the study area.

Key Words: Urinary schistosomiasis; Prevalence; Pupils; Oyan dam; Nigeria.

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INTRODUCTION

Schistosomiasis is one of the most widespread of all human parasitic diseases, ranking second only to malaria in terms of its socioeconomic and public health importance in tropical and subtropical areas (Chitsulo, 2000). Schistosomiasis is a major public health problem affecting over 200 million people worldwide (WHO, 2010). As a mainly rural, often occupational disease, schistosomiasis principally affects people who are unable to avoid contact with natural water sources, either because of their profession (agriculture, fishing) or because of lack of reliable water for drinking, washing and bathing (Chandiwana, 1987; Emejulu *et al.*, 1994, Ekpo *et al.*, 2010). Increased population movement seems to enhance the spread of the disease, and schistosomiasis is now occurring increasingly in periurban areas (Oliveira, 2004).

The establishment of water resource development projects has been associated with outbreaks of schistosomiasis in many parts of tropical Africa (Ofoeze *et al*., 1991). Although the development of water resources is overall immensely beneficial to a developing country like Nigeria which seeks to boost agricultural production to feed its growing population, evidence abounds to show that the planning, design and execution of such projects are often undertaken without considering their health implications (Oladejo and Ofoeze, 2006; Akinwale *et al*., 2010). As a consequence water related disease, such as schistosomiasis, are spreading (Oladejo and Ofoeze *et al*., 2006).

In 1982, the Ogun-Oshun River Basin Development Authority which governs one of the eleven river basins established by the Federal Government of Nigeria to undertake large scale agricultural production, commissioned its first large multi-purpose dam, the Oyan River Dam (Ofoeze *et al*., 1991). The dam is located 20km north-west of Abeokuta, the capital of Ogun State, Nigeria. It has an embankment length and height of 1044m and 30m, respectively, a reservoir capacity of 270million cubic metres with a surface area of 40km^2 and an elevation of 63m. The creation of this reservoir resulted in the displacement of approximately 1000 individuals from 22villages. Although these villagers were resettled at two sites, Ibaro-Oyan and Abule Titun, on the bank of the reservoir, the resettlement villages were not provided with adequate health care, water-supply or waste disposal systems.

Conditions favourable for snail breeding, the location of the villages on the reservoir's bank, intensive water contact resulting from exploitation of the fishing opportunities that had been created, and the low environmental health status resulted in the introduction of urinary schistosomiasis, which, by 1988 had already reached an epidemic stage (Ofoezie *et al.*, 1991). Dam construction had been associated with *S. haematobium* in many

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parts of Nigeria especially the Ogun–Oshun dam river system. Ofoezie and co-workers (1991) reported an overall prevalence of 80% of urinary schistosomiasis in Ibaro-Oyan and Abule Titun after the establishment of the dam. Though recent studies showed that the prevalence of the disease is still high around the dam (Sam-Wobo *et al.*, 2009; Akinwale *et al.*, 2010), the present study aims to determine the current status of urinary schistosomiasis among the pre-school, school-aged children and teenagers in the communities around the dam with the view of recommending appropriate control measures to safe-guard this vulnerable population.

METHODS

Description of study area

Abule Sikiru, Ibaro-Oyan and Abule Titun are among the lakeside communities at the Oyan reservoir. Abule Sikiru and Ibaro-Oyan are under Abeokuta North Local Government while Abule Titun belongs to Odeda local government. The three communities are located about 20km north-west of Abeokuta, the capital of Ogun State and lie approximately between longitude 2° 31' and 4° 31' E and latitude 6° 31' and 8°N. The three communities had an estimated population of about 150 inhabitants each of which approximately 40% constituted the pre-school and school-aged children. The adult population of Ibaro–Oyan and Abule Titun (about 1km adjacent to the dam) are mainly fishermen but some of them also engage in farming and trading, whereas the inhabitants of Abule Sikiru (about 3km away to the dam) are mainly into sales of sand which surrounds the dam. Smaller river run through the three communities to the dam. There exists a government primary school in each of the villages but the communities do not have access to some basic amenities such as pipe-borne water, electricity or a waste disposal system. Though, Abule Titun has a health centre, the centre is under-equipped. The lack of access to a reliable waste disposal system results into the indiscriminate disposal of human waste into the dam.

Ethical clearance

The study protocol was approved by the Ethical Review Board of the Ministry of Health, Ogun State, Nigeria. Written consent and approval were obtained from the village heads and also the Health Officer of the Primary Health Care Centre at Abule Titun. Interactive sessions were also held with all respondents and their parents to inform them about the purpose of the study. Verbal consent was obtained from participants before the study commenced.

Sample collection

The study was carried out in three communities, Ibaro-Oyan, Abule Titun and Abule Sikiru, between August and October 2009. All children and teenagers aged between 1 and 20 years were encouraged to participate in the study through their village heads and their parents. Dark (black) labelled sterile bottles of about 20ml were given to parents/guardians of the children to collect urine samples. This was done between the hours of 9.00 to 11.00 am. Menstruating females were excluded from the study. A total of 120 children and teenagers (response rate 66.7% from an expected 180 eligible persons) were enrolled into the study.

Parasitological examination of urine samples

Urine samples were immediately transported to the laboratory (20km from the study communities) where they were examined using Medi-Test Combi 9 reagent strip for the presence of microhaematuria and pH according to the manufacturer's instruction. For microscopic examination, 10ml of a duly labelled urine sample was poured into a centrifuge tube and spun at 5000 rpm for five minutes in a centrifuge. The supernatant was decanted and the deposit at the bottom of the tube was viewed under the compound microscope. A drop of the deposit was observed on the slides by adding a drop of lugol's iodine before covering with a cover slip. *S. haematobium* eggs were identified and counted under x 10 and x 40 magnification and recorded as eggs/10ml of urine.

Data analysis

SPSS version 16 (SPSS Inc, Chicago, Illinois) statistical software was used to obtain frequencies. Chi-square tests and student t-tests were used for comparing infection and determining the relationship between infection pattern, age and sex in the study communities. 95% confidence intervals (95%-CI) were calculated for the prevalence. Kappa statistic was used to assess overall concordance of diagnostic positivity assessed by the Combi-9 strip stick test and Schistosoma ova.

RESULTS

The results of the parasitological examinations of the urine samples are presented in Table 1. Of 120 urine samples screened for haematuria using Combi-9 strip stick, 80 (66.7%; 95%-CI: 57.5 to 75.0) samples were positive for haematuria. Ibaro Oyan recorded the highest prevalence (75%) while the lowest was recorded at Abule Sikiru (42.9%). Moreover, the egg counts of the urine samples showed an overall prevalence of 71.7% (95%-CI: 62.7 to 79.5) with the highest prevalence at Abule Titun (80%) while Abule Sikiru again recorded the lowest prevalence (46.4%) (Table 1). Though more urine samples were positive for the eggs of *S. haematobium* as compared with strip stick, the analysis showed high agreement between the two diagnostic methods (kappa=0.81; $p<0.001$) (Table 2).

Generally, both Combi-9 strip stick and microscopy revealed that females were more infected than males in the study communities, however these differences were not statistically significant (overall: p=0.058, p=0.258, respectively. In Abule Titun the prevalence of *S. haematobium* eggs was higher in males (83.3%) than in females (77.3%), though again not statistically significant. The prevalence of microhaematuria and *S. haematobium* eggs increased with age overall (p=0.030, p=0.006, df=2, respectively)(Tables 3 and 4).

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Table 1: Summary of the parasitological examinations of urinary schistosomiasis at three study communities around Oyan dam, Nigeria.

Community	No. examined	No. infected with ova	Status of males	Status of females	No. positive for micro	Status of males	Status of females
Abule Titun	40	32 (80.0%)	15/18 (83.3%)	17/22 (77.3%)	29 (72.5%)	12/18 (66.7%)	17/22 (77.3%)
Ibaro-Oyan	52	41 (78.8%)	20/27 (74.1%)	21/25 (84.0%)	39 (75.0%)	19/27 (70.4%)	20/25 (80.0%)
Abule Sikiru	28	13 (46.4%)	4/14 (28.6%)	9/14 (64.3%)	12 (42.9%)	3/14 (21.4%)	9/14 (64.3%)
Total	120	86 (71.7%)	39/59 (66.1%)	47/61(77.0%)	80 (66.7%)	34/59 (57.6%)	46/61 (75.4%)

Table 2: The association between the participants positive for *Schistosoma* ova and haematuria around Oyan dam, Nigeria.

	Haematuria		
Schistosoma ova	Positive	Negative	Total
Positive	78	8	86
Negative	2	32	34
Total	80	40	120

Table 3: Prevalence of *Schistosoma* ova stratified by age for 120 Nigerian children and teenagers.

Age (years)	No. of respondents examined and infected in Abule Titun (% infection)	No. of respondents examined and infected in Ibaro-Oyan (% infection)	No. of respondents examined and infected in Abule Sikiru (% infection)	Total (% infection)
1-5	11/17 (64.7%)	17/26 (65.4%)	6/16 (40.0%)	34/59 (57.6%)
6-10	13/15 (86.7%)	20/22(90.9%)	4/7 (57.1%)	37/44 (84.1%)
11-15	7/7 (100%)	3/3 (100%)	2/5 (40.0%)	12/15 (80.0%)
16-20	1/1 (100%)	1/1 (100%)	1/1 (100%)	3/3 (100%)
Total	32/40 (80.0%)	41/52 (78.8%)	13/28 (46.4%)	86/120 (71.7%)

Table 4: Prevalence of microhaematuria stratified by age for 120 Nigerian children and teenagers.

Age (years)	No. of respondents examined and positive in Abule Titun (% infection)	No. of respondents examined and positive in Ibaro-Oyan (% infection)	No. of respondents examined and positive in Abule Sikiru (% infection)	Total (% infection)
1-5	10/17 (58.8%)	16/26 (61.5%)	6/15 (40.0%)	32/58 (55.2%)
6-10	13/15 (86.7%)	19/22 (86.4%)	3/7 (42.9%)	35/44 (79.5%)
11-15	5/7 (71.4%)	3/3 (100%)	2/5 (40.0%)	10/15 (66.7%)
16-20	1/1 (100%)	1/1 (100%)	1/1 (100%)	3/3 (100%)
Total	29/40 (72.5%)	39/52 (75.0%)	12/28 (42.9%)	80/120 (66.7%)

DISCUSSION

The overall prevalence of 66.7% and 71.7% recorded for haematuria and egg counts, respectively, in the study communities among the young participants showed that the communities around Oyan dam, Nigeria, was still endemic to urinary schistosomiasis. The prevalence of infection in the present study is higher than recently reported for adult populations by Akinwale and co-workers (2010) but lower than the rate reported by Sam-Wobo and co-workers (2009). Regular visits of the dam due to domestic and recreational activities might cause continued and active transmission of the disease despite the availability of alternative sources of water through streams and dilapidated wells. On the other hand, the high prevalence of the disease could also be a result of contamination of the streams in the study area since residents also use these waterways for domestic purposes.

Interactions between the study participants and their parents during the study highlighted that many community members had little knowledge of schistosomiasis transmission through the contact with water from the dam or otherwise and thus were unaware of transmission pathways. The differences observed in the prevalence of the infection between the communities may be attributed to differences in their contact with the dam. The relatively low prevalence observed for Abule Sikiru could be a result of its distance to the dam while Ibaro Oyan and Abule Titun are comparatively much closer to it.

The higher prevalence of the infection in the older age-groups is consistent with previous reports by Chandiwana (1987), Mafiana and Omotayo (1994) and Emejulu and co-workers (1994). The higher infection rates in older age groups might be a reflection of susceptibility to *S. haematobium* and/or of increased contact with infected water through swimming and fishing (Mafiana and Omotayo, 1994). The present study found slightly higher infection

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rates in females however the differences were not statistically significant, most likely because of the relatively small sample size. The study also showed that some of the participating children were already infected during infancy. Similar observation were previously reported on this age group elsewhere (Ekpo *et al*., 2010).

In conclusion, the present study has documented a high prevalence of urinary schistosomiasis among children and teenagers. The results are indication that the communities around the Oyan dam are still endemic to schistosomiasis. There is therefore need for large scale public health interventions together with public education on transmission pathways and risk factors for the infection. The provision of basic amenities such as motorised boreholes and efficient waste disposal facilities by the government would certainly contribute to a reduction of human activities at the dam and its contamination with human waste. Wide distribution and use of paraziquantel is additionally required to stem the transmission and morbidity of the disease at the study area.

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