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Full Length Research Paper

Urinary schistosomiasis among pre-school and school aged children in two peri-urban communities in Southwest Nigeria

Babatunde, T. A., Asaolu, S. O. and Sowemimo, O. A*.

Department of Zoology, Obafemi Awolowo University, Ile-Ife, Nigeria.

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A cross-sectional study was conducted between March and April, 2010 among pre-school and school aged children in two peri-urban communities in Osun State, Southwest Nigeria. Urine samples were collected from the pre-school and school aged children, tested for microhaematuria using reagent strips, processed and examined for *Schistosoma haematobium* ova. Out of 274 pupils examined, 132 (48.2%) had infection, with no statistically significant difference (P > 0.05) in infection between male (48.6%) and female pupils (47.6%). The prevalence of infection increase significantly with age (P < 0.05), with the peak (93.3%) of infection recorded in pupils aged 15 to 16 years and the lowest infection (10.0%) in pupils aged 3 to 4 years. There was no statistically significant association (P > 0.05) between intensity in male pupils (156.0 ± 34.5/10 ml) and female pupils (141.7 ± 29.5/10 ml). The prevalence of pupils with microhaematuria was 65.0% and it increased significantly with age (P < 0.001). The conclusion drawn from the study is that to reduce the transmission of *S. haematobium* in endemic communities, health education and provision of potable water are advocated.

Key words: *Schistosoma haematobium*, microhaeamturia, prevalence, urinary schistosomiasis, school-aged children, Nigeria.

INTRODUCTION

Schistosomiasis remains an important public health problem globally, with approximately 779 million estimated to be at risk (Hotez, 2009). Within sub-Saharan Africa, Nigeria is the country with the highest prevalence of human schistosomiasis; about 29 million in 2008 (Hotez and Kamath, 2009). Urinary schistosomiasis is a human disease condition which is caused by infection of the trematode *Schistosoma haematobium*. The parasite is found in the venous plexus draining the urinary bladder of humans (World Health Organization (WHO), 2002). During infection, the parasites deposit terminal spined eggs which clog the venous plexus, impeding blood flow. The eggs of *S. haematobium* provoke granulomatous inflammation, ulceration and pseudo-polyposis of the vesical and ureteral wall. Haematuria is a very common sign of infection but other signs include dysuria, pollakisuria and proteinura. Kidney failure deaths due to urinary tract scarring, deformity of ureters and the bladder caused by *S. haematobium* infection have become less common due to the use of effective drug praziquantel (Gryseels et al., 2006). In Nigeria, urinary schistosomiasis is widespread in both rural and urban communities;

*Corresponding author. E-mail: yomi_showemimo@yahoo.com, osowemimo@oauife.edu.ng. Tel: +2348034425965.

with prevalences ranging between 2 and 90% and the vast majority of cases occurring among the poor and marginalized (Ugbomoiko, 2000; Mafiana et al., 2003; Oladejo and Ofoezie, 2006; Opara et al., 2007). Several studies on schistosomiasis in Nigeria have focused on school-aged children and adults, with little or no information on pre-school children. Recently, urinary schistosomiasis infections have been reported in pre-school children in settlements in Ogun State and Cross River State, all in Nigeria (Opara et al., 2007; Ekpo et al., 2010). However, information on the endemicity of this disease is still lacking in some parts of the country and data collected is still grossly inadequate for planning a credible control programme.

The study was planned with the aim of providing epidemiological data on the status of schistosomiasis infection among pre-school and school aged children of Akinlalu and Ogbagba communities of Osun State Southwest Nigeria. It is hoped that the results to be generated will complement the existing baseline information on the epidemiology of this infection in the country.

MATERIALS AND METHODS

Study area

This cross-sectional study was carried out in the peri-urban/rural communities Akinlalu and Ogbagba both situated in Osun State in Nigeria. Akinlalu (07° 28´N, 04° 15´E) is situated in Ife North Local government Area and Ogbagba (07° 42´N, 04° 15´E) is situated in Ife East Local Government Area both in Osun State. The two communities are in the rainforest belt of Nigeria and the annual rainfall in the region ranges from 1,000 to 4,000 mm. The average maximum and minimum daily temperatures are 32 and 20°C, respectively (Asaolu et al., 1991). The climate is tropical with distinct dry (November to March) and rainy (April to October) seasons (Asaolu et al., 1991). The ecological characteristics of, as well as the socio-cultural and daily economic activities in both communities are similar. Farming and petty trading are the main occupations, and most residents are of Yoruba ethnicity. Neither of the communities has reliable pipe-borne water supply. However, both communities have shared community wells and rivers which are frequently visited for domestic use as well as leisure and religious beliefs.

Study population and design

A school-based cross-sectional study was conducted between March and April, 2010. The study samples were taken by random sampling from pre-school and school age children population attending Surajudeen Primary School, Akinlalu and Sacred Heart Catholic Mission School, Ogbagba Osun State, Nigeria. For schistosomiasis control, WHO recommends that 200 to 250 school aged children should be sampled in each ecological zone (Montresor et al., 1998). A total of 51 pupils from Ogbagba community and 223 pupils from Akinlalu, making a total of 274 children took part in the study. The permission of the community leaders, local government and school authority was obtained before the commencement of the study. In addition, the consent of the parents of the children was also obtained. The study protocol was approved by the Ethical Committee of the Obafemi Awolowo University Teaching Hospital Complex (OAUTHC).

Data collection

Each child was provided with a pre-labelled, wide-mouthed, screw capped container for the collection of a mid-day urine sample. Each urine sample was divided into two portions: a portion of the urine sample was tested for microhaematuria using commercial reagent strips (Medi-test Combur-9; Analyticon Biotechnologies, Lichtenfels, Germany) in accordance with the manufacturers' instructions. The other portion of the urine samples were transported to the parasitology laboratory at the Obafemi Awolowo University, Ile-Ife's Department of Zoology and preserved by adding two drops of formaldehyde. A pretested structured questionnaire was used to collect demographic and socio-economic data.

Laboratory analysis

A 10 ml of the preserved urine samples were passed through a 8 µm pore membrane filter, so that any *S. haematobium* eggs could be trapped on the filter and counted under a light microscope and recorded as eggs/10 ml of urine (WHO, 1983).

Statistical analysis

Version 16.0 of the statistical package for social sciences (SPSS) for windows software package (SPSS Inc, Chicago, IL) was used for all the data analysis, comparisons of prevalence by subject age and gender was made using χ^2 tests. Differences in mean egg counts between dichotomous variables and variables with more than two levels were explored using Student's t-tests and one-way analysis of variance (ANOVA), respectively.

RESULTS

A total of 274 pre-school and school aged children were enrolled for this study and they all submitted urine samples. The age of the children ranged from 3 to 16 years, with a mean (standard deviation, SD) of 9.0 (3.4) years and a median of 9 years. 148 (54.0%) of them were boys while 126 (46.0%) were girls.

Prevalence and intensity of *S. haematobium* infection by age and sex

The overall prevalence of *S. haematobium* infection was 48.2%. The prevalence pattern showed an increasing trend with increasing age, and peaked around 15 to 16 years. The lowest prevalence of 10.0% was recorded among the pre-school children aged 3 to 4 years. There was a significant difference in prevalence of infection between ages ($\chi^2 = 59.085$, df = 6; P = 0.000). However, there was no statistically significant difference ($\chi^2 = 0.029$, df = 1; P = 0.865) in prevalence between the boys 72

Table 1. Prevalence and intensity of *S. haematobium* among the children in the two communities.

Age (years)	No. Examined	No. Infected	Percentage (%)	Mean ± (SEM)
3-4	30	3	10.0	4.13±2.46
5-6	42	13	31.0	183.64±74.36
7-8	57	17	29.8	126.70±54.46
9-10	55	33	60.0	158.93±54.59
11-12	40	27	67.5	215.65±66.79
13-14	35	25	71.4	191.66±55.00
15-16	15	14	93.3	120.20±31.69
Total	274	132	48.2	149.41±23.00
P-value		<0.05		<0.05
Sex				
Male	148	72	48.6	156.00±34.50
Female	126	60	47.6	141.73±29.51
P-value			>0.05	>0.05

SEM : Standard error of mean.

(48.6%) and girls 60 (47.6%) (Table 1). The overall mean intensity of infection was 149.41 ± 23.00 eggs/10 ml. Pre-school children aged 3 to 4 years had the lowest intensity of 4.28 eggs/10 ml while the highest mean intensity of 221.8 eggs/10 ml was recorded in pupils aged 11 to 12 years. There was a significant difference between age and intensity of infection ($P < 0.001$). The male pupils have a higher intensity (156.00 ± 34.50 eggs/10 ml) than the female pupils (141.73 ± 29.51 eggs/10 ml), however there was no statistically significant difference between age and intensity of infection ($P > 0.05$) (Table 1).

Micro-haematuria and visible haematuria

Micro-haematuria was detected in 178 (65.0%) of the 274 urine samples, out of which 47(92.2%) were from Ogbagba community while 131 (58.7%) were from Akinlalu. Out of the 178 with micro-haematuria, 86 (31.4%) had gross haematuria, 48 (17.5%) moderate haematuria and 44 (16.4%) mild haematuria. The prevalence of microhaematuria by age showed that the lowest prevalence of 13.3% was recorded in pupils' age 3 to 4 years while the highest of 100% was recorded in the pupils' age 15 to 16 years (Table 2). The prevalence of female pupils 82 (65.1%) with microhaematuria was higher than that of male pupils 96 (64.9%) but there was no statistically significant difference in the prevalence of micro heamaturia between the sexes ($P > 0.05$) (Table 2). Visible haematuria was observed in 44 (16.1%) of the 274 urine samples, out of which 9 (17.6%) pupils from Ogbagba community showed visible haematuria while 35 (15.7%) pupils were from Akinlalu. Male pupils had a higher prevalence (21.6%) of visible haematuria than female pupils (9.5%). There was a significant difference between the prevalence of visible haematuria between the two sexes ($\chi^2 = 7.30$, df = 1, $P = 0.007$). The lowest prevalence (6.7%) of visible haematuria was recorded in pupils aged 3 to 4 years while the highest prevalence (46.7%) was recorded in pupils aged 15 to 16 years. There was a significant differences between the prevalence of visible haematuria among the various age groups ($\chi^2 = 14.804$, df = 6, $P = 0.022$) (Table 3).

DISCUSSION

This study showed that urinary schistosomiasis is endemic in some communities in Osun State and it corroborates with findings of some earlier studies in this geographical region (Oladejo and Ofoezie, 2006; Ugbomoiko et al., 2010). The overall prevalence of urinary schistosomiasis recorded (48.2%) in this study is about four times higher than the National Nigerian mean of about 13% (Ofoezie, 2002). This result is comparable to 47% reported in settlements near Erinle River Dam, Osun State, Nigeria (Oladejo and Ofoezie, 2006) and lower than 62% reported from two communities in Southwest Nigeria (Ugbomoiko et al., 2010), 71.8% from settlements near a dam reservoir, Ogun State, Nigeria (Mafiana et al., 2003) and 58.1% from Ilewo-Orile community in Ogun State (Ekpo et al., 2010). From the results obtained in this study and previous studies as highlighted above, it appears that urinary schistosomiasis is particularly common in the southwest region of Nigeria. This study showed that there was an increasing trend of

Table 2. Prevalence (%) of micro-haematuria in relation to age and sex of children in Akinlalu and Ogbagba communities.

Age (years)	No. Examined	No. and (%) with no haematuria	No. and (%) with mild haematuria	No. and (%) with moderate haematuria	No. and (%) with gross haematuria	No. and (%) with positive haematuria
3 – 4	30	26 (86.7)	1 (3.3)	1 (3.3)	2 (6.7)	4 (13.3)
5 – 6	42	24 (57.1)	6 (14.3)	4 (9.5)	8 (19.0)	18 (42.9)
7 – 8	57	23 (40.4)	12 (21.1)	10 (17.5)	11 (19.3)	33 (57.9)
9 – 10	55	13 (23.6)	11 (20.0)	10 (18.2)	21 (38.2)	42 (76.4)
11 – 12	40	3 (7.5)	5 (12.5)	12 (30.0)	20 (50.0)	37 (92.5)
13 – 14	35	6 (17.1)	5 (14.3)	8 (22.9)	16 (45.7)	29 (82.9)
15 – 16	15	0 (0.0)	4 (26.7)	3 (20.0)	8 (53.3)	15 (100)
P-value		<0.05	<0.05	<0.05	<0.05	**<**0.05
Sex						
Male	148	52 (35.1)	17 (11.5)	31 (20.9)	48 (32.4)	96 (64.9)
Female	126	43 (34.1)	27 (21.4)	17 (13.5)	38 (30.2)	82 (65.1)
P-value			<0.05	<0.05	>0.05	>0.05
Community						
Akinlalu	223	92 (41.3)	39 (17.5)	28 (12.6)	64 (28.7)	131 (58.7)
Ogbagba	51	3 (5.8)	5 (9.8)	20 (39.2)	22 (43.1)	47 (92.2)
Total	274	95 (34.7)	44 (16.4)	48 (17.5)	86 (31.4)	178 (65.0)

prevalence infection among children from three years to sixteen years. This is in conformity with the general pattern of *S. haematobium* infection in endemic areas. Similar findings were reported by previous workers who studied *S. haematobium* infection among school children and stated that individuals aged 5 to 15 years were more likely to be infected with *S. haematobium*. (Okoli and Odaibo, 1999; Ejima and Odaibo, 2010). However, some studies reported a decline in infection from 14 years and attributed the declining trend in prevalence of infection among children aged 15 years and above to probable age acquired immunity (Satayathum et al., 2006).

In this study, the prevalence of infection was higher among the male pupils (48.6%) than in female pupils (47.6%), however, no statistically significant difference in the prevalence of infection between both sexes. This may be an indication that both male and female pupils are equally exposed to infection through water contacts. Previous studies have also reported higher prevalence among male pupils than among their female counterparts (Akinwale et al., 2010; Ejima and Odaibo, 2010; Ekpo et al., 2010). The intensity of infection was also higher among male pupils; this is suggestive that male pupils carry a greater worm burden than the females. Similar findings were reported in previous studies (Ariyo et al., 2004; Ejima and Odaibo, 2010).

The prevalence of microhaematuria in this study (65.3%) shows no statistically significant difference between the sexes. This is due to the fact that microhaematuria is a characteristic symptom of urinary schistosomiasis in endemic communities where its prevalence correlated positively with urinary schistosomiasis infection (Anosike et al., 2001). Visible haematuria was recorded in this study and was an on the spot indication of the

Table 3. Prevalence (%) of visible haematuria in relation to age and sex of the children in the two communities.

Age (years)	No. examined	No. and (%) with visible haematuria
3 – 4	30	2 (6.7)
5 – 6	42	6 (14.3)
7 – 8	57	7 (12.3)
9 – 10	55	7 (12.7)
11 – 12	40	9 (22.5)
13 – 14	35	6 (17.1)
15 – 16	15	7 (46.7)
P-value		< 0.05
Sex		
Male	148	32 (21.6)
Female	126	12 (9.5)
P-value		**<**0.05
Community		
Akinlalu	223	35 (15.7)
Ogbagba	51	9 (17.6)
Total	274	44 (16.1)

presence of urinary schistosomiasis in the study communities. The prevalence of visible haematuria recorded in this study (16.1%) compares favourably with 17.9% from Ishielu Amagunze, Enugu state Nigeria (Nwaorgu et al., 1998). It was noted that even though the disease is associated with river water, a high level of illiteracy, ignorance and traditional beliefs as well as unavailability of pipe borne water and insufficient boreholes have contributed to the endemicity of *S. haematobium* in the two communities. In both communities it is still believed by some that rivers “Amula” and “Ooye” situated in Akinlalu and Ogbagba, respectively have healing and medicinal powers. Provision of basic health education and portable water in the study communities will reduce contact of humans with infested water and thereby reduce transmission. Periodic mass treatment will reduce morbidity and gradually eradicate the disease in the two communities.

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