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RESEARCH ARTICLE

Epidemiological Studies on Urinary Schistosomiasis in Osun State, Nigeria

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ABSTRACT

Schistosomiasis is a parasitic disease of the tropics which is estimated to affect up to 300 million people worldwide. Studies on Urinary Schistosomiasis amongst school children in Osun state, Nigeria was carried out between January 2006 and October 2008 to determine the incidence, prevalence, intensity and the effect of human-water activity on the prevalence of Schistosomiasis in the study area. A total of 1200 urine samples were collected. *Schistosoma haematobium* infections were detected by microscopic examination of schistosome eggs in urine. Mean egg count (MEC) was calculated to determine the intensity and morbidity of infection. Incidence study and water contact activities were also carried out. The Incidence rate reduced from 25% in 2007 to 17% in 2008. Water contact activities observed include bathing, swimming, washing of clothes, fetching of water and farming (fishing). Domestic water contact amounted to 45.1% (780/1730) of all water contacts observed while recreational activities accounted to 31.2% (540/1730). The overall prevalence of *S. haematobium* infection in the study was 12.7% (152/1200). MEC was highest among males in age group 15-20 years (5 eggs/10mls) and lowest among males in age group 5-9 years (1.2 eggs/10mls). The result of this study shows that urinary schistosomiasis is still endemic in different senatorial district of Osun state Nigeria although incidence of the infection has greatly reduced compared to previous report. However, human contact with rivers that serves as breeding sites for the disease is still ongoing suggesting continuing human re-infection, which may lead to future increase in human prevalence.

KEYWORDS

Urinary Schistosomiasis, Epidemiology, School children, Osun state, Nigeria

INTRODUCTION

Schistosomiasis remains an important world health problem, especially in developing countries, even after the strategy for morbidity control through treatment programs and preventive measures. Schistosomiasis is one of the widespread of human parasitic infections affecting over 200 million people in more than 74 countries[1].

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It is the most important water-borne disease and presents the greatest risk to health in rural areas in developing countries[2]. Schistosomiasis is a chronic and debilitating disease caused by the blood fluke (trematode). Genus *Schistosoma* is a digenetic trematode. Five species of this parasite infect man. These include *S. mansoni*, *S. haematobium*, *S. japonicum*, *S. mekongi* and *S. intercalatum*[3]. Except *S. japonicum* and S mekongi, all these species are endemic in varying degrees in different parts of Nigeria. However, *S. haematobium* is more widely

distributed than other species[4]. The widely distribution of S. haematobium and its endemicity in Osun state had also been confirmed in a study[5]. The cost of diagnosis at the community level is usually very expensive; as a result, school children that are the highest risk group are targeted in prevalence and intensity survey. Diagnostic chemical strips can measure semi quantitative levels of urinary blood or protein[6]. The study was designed to determine prevalence/intensity, compare a rapid assessment of the status of urinary schistosomiasis with the conventional microscopy method, the incidence rate and water contact activities in endemic area of Osun State.

MATERIALS AND METHOD

Study Area

The study was carried out in Osun State, which is located in the South-Western part of Nigeria and is bounded by Ogun, Kwara, Oyo and Ondo in the South, North, West and East respectively. According to the 1991 National Population Census (NPC), Osun has a population of 2.2 Million people which is made up 1.079 million males and 1.123 million females. In the population census of 2006, Osun state was estimated to be about 3 Million. The focal study area is Ilie in Olorunda Local Government Area, Osun State. Ilie is about 20 km from Igbona, headquarter of Olorunda Local Government Area of osun State where Incidence rates and water contact activities were carried out.

Subjects, Sampling Technique and Sample Collection

The ethical approval was given by Ministry of Education in conjunction with Ministry of Health. The schools in Osun state were randomly selected by balloting from the list of schools in towns and villages that are contigious with streams and rivers. Consenting school children were then selected into the study and their data were taken. The survey was conducted between 2006 and 2008 in the study area. Urine samples were collected between the hours of 10am and 2pm using wide-mouthed, screw-cap plastic containers according to WHO recommendation[7]. Subjects were instructed to produce mid-stream or terminal urine sample. The names, sexes and ages of the subjects were entered against the appropriate number on the epidemiological field form on submission of the samples. Each sample container was labelled appropriately. Heamaturia was also screened with chemical strips (Medi-Test COMBI-9) and urinary blood were recorded variously as positive (+, ++ and +++) or negative as the case may be. Also 10ml urine samples were examined microscopically using standard sedimentation by centrifugation method and eggs screened for were counted.

Incidence Study and Human-Water Contact Activities

The survey was conducted between January and October 2006 to determine the present prevalence of urinary schistosomiasis in Ilie community among the school children. This was followed up by the general treatment of all 150 school children (both positives and negatives) selected for the cohort study with single dose 40mg/kg of Praziquantel immediately in October 2006. A resident Doctor in Ladoke Akintola University Teaching Hospital (LTH) who was in the team administered treatment. In November 2006 which is exactly one month after treatment, Urine samples were screened for the presence of eggs of *S. haematobium*. This was done to rule out resistance to the drugs administered but they were all negative. After three months post treatment, a monthly visit was made to the study area with the sole aim of collecting sample for the study from January to December 2007 to determine urine positive to *S. haematobium* after treatment. The number positives were noted for each month for the next 12 months. At the end of December 2007, another general treatment was conducted for all the 150 school children in the community (both positives and Negatives). This was also followed up by the collection of Urine at the end of each month from January 2008 to December 2008 in search for Urine with positive *S. haematobium* eggs. The numbers for each month were noted and added together. Incidence

rates were then calculated for each year in the 2years observational studies.

Direct water contact observations[8], were made at Ilie dam from 6.00am- 6.00pm daily, once a month for 12 months (January 08 –December 08). Results were analyzed using descriptive statistics such as simple averages and percentages[9].

Data Analysis

Chi- square was used to test relationship between independent and dependent variables.

RESULTS AND DISCUSSION

A total of 1200 children were surveyed in primary and post primary schools located in 3 senatorial districts of Osun State Nigeria. 400 samples were collected from each senatorial district. The mean age was 10 years. Urine samples were collected from 577 (48.1%), 574 (47.8%) and 50 (4.2%) subjects in the age groups 5-9, 10-14 and 15-20 respectively. Also out of 1200 urine samples collected, 610 were from male and 590 from female Table 1.

Out of the 1200 subjects examined, 152 (12.7%) were positive for *S. haematobium* infection with prevalence ranging from 3.8 to 29% in the 3 senatorial zones. Prevalence of urinary schistosomiasis was significantly higher in Osun central zone (29%) than Osun west (5.3%) and Osun East (3.8%) (P=0.001) Table 2. The intensity of infection determined by MEC was 1.5 eggs/10mls of urine. The intensity of infection was highest in Osun central (3.9 eggs/10mls of urine), compared to Osun east and Osun west (0.3 eggs/10mls of urine) respectively.

More females (13.8%) than males (11.5%) were infected among the subjects but the difference was not statistically significant (P= 0.207) Table 3.

The breakdown of prevalence and intensity according to age and sex are shown in table 4. The prevalence and intensity of infection tends to be higher among females except in age group 15-20 years where the males recorded higher prevalence and intensity. Males in age group 15-20 years had the highest prevalence (36.7%) and intensity (5.0 eggs/10mls) while males in age group 5-9 years had the lowest prevalence (8.4%) and intensity (1.2 eggs/10mls). The differences in age and sex are not statistically significant

In Table 5, all the positive urine samples had haematuria with Combi 9. Although blood was visibly seen in 50 of the positive urine while 102 urine samples had clear normal urine colour but had haematuria when tested with Combi 9. The degree of haematuria varies from one plus (+) to three pluses (+++).

Table 6 shows that the number with haematuria decreases with increase in age group and the only exception was in age group 10-14 years. One plus (+) degree of haematuria had the highest number of 92, followed by (++) 52 and (+++) 8 respectively. Age group 10-14 with one plus (+) degree of haematuria had highest percentage of 56.4%.

Figure1 highlighted Incidence proportion, also known as cumulative incidence; this is the number of new cases within a specified time period divided by the size of the population initially at risk. Therefore, population initially contained 150 non diseased persons and 38 developed *S. haematobium* infection over a year of observation, the incidence proportion is 38 cases per 150 persons. Incidence rate is the number of new cases per unit of person-time at risk therefore incidence rate of 38 cases per 150 persons/ year is (25%).

Using person –time rather than just time handles situations where the amount of observation time differs between people, or when the population at risk varies with time[10] modified in 2008.

Figure 2 shows that incidence rate of 26 cases per 150 person-year is (17%). The figure shows the cumulative incidence per each month over a year.

Water contact activities were observed all the year round at Erinle dam. Water contact activities observed include bathing, swimming, washing of clothes, fetching of water and farming (fishing).

Table 1: Demographic distribution of subjects in Osun state

Factors	Classifications	Frequency (%) N= 1200	Mean ± SD
Age group	5-9 yrs	577 (48.1)	71.1 ± 1.4
	10-14 yrs	574 (47.8)	12 ± 1.4
	15-20yrs	50 (4.2)	
Gender	Male	610 (50.8)	
	Female	590 (49.2)	
Locations	Osun Central	400 (33.3)	
	Osun East	400 (33.3)	
	Osun West	400 (33.3)	

Table 2: Prevalence and Intensity of Urinary Schistosomiasis in 3 senatorial zones in Osun state

Senatorial zones	No. Examined	M:F	Mean age	No. Infect. (%)	MEC/ 10mls Urine	P. value
Osun Central	400	192:208	11.0 ± 3.4	116 (29)	3.9 ± 7.8	<0.0001
Osun East	400	210:190	9.7 ± 3.0	15 (3.8)	0.3 ± 1.6	
Osun West	400	210:190	9.2 ± 3.0	21 (5.3)	0.3 ± 1.4	
Total	**1200**	**612:588**	**9.8** ± 3.1	**152 (12.7)**	**1.5** ± 5.0	

M:F=Male:Female,MEC=MeanEggCount

Table 3: Gender-related prevalence of Urinary Schistosomiasis in the study area

Gender	No. Exam	No. Positive (%)	Mean egg /10mls urine ± SD	P. value
Male	612	70 (11.5)	1.4 ± 5.1	**0.2270**
Females	588	82 (13.8)	1.6 ± 5.0	
Total	**1200**	**152(12.7)**	**1.5** ± 5.0	

Table 4: Intensity of Schistosoma haematobium infection by age and gender

Age group (yrs)	Gender	No. Examined	No. Infected (%)	MEC/10mls urine ± SD	P. value
5-9	Male	311	26 (8.4)	1.2 ± 5.1	0.2087
	Female	266	31 (11.7)	1.7 ± 4.9	
10-14	Male	282	38 (13.5)	1.4 ± 4.2	0.7196
	Female	292	43 (14.8)	1.6 ± 5.0	
15-20	Male	19	7 (36.7)	5.0 ± 11.8	0.5319
	Female	30	7 (23.3)	1.5 ± 3.0	
Total		**1200**	**152 (12.7)**	**1.5** ± 5.0	**0.2270**

Domestic water contact i.e. washing of clothes and fetching of water (mainly by females) amounted to 45.1% (780/1730) of all water contacts observed while recreational activities i.e. swimming and bathing (mainly by males) accounted to 31.2% (540/1730). In Male and Female, fetching of water represented 27.2%(470/1730), other activities were washing of clothes 26.0% (450/1730), bathing 24.9% (430/1730), swimming 15.6% (270/1730) and farming (fishing) 6.4% (110/1730) respectively.

Table 5: Age- related haematuria in *S. haematobium* positive urine in Osun state.

Age Group	***Infection with Haematuria No %***
5-9	57 (37.5)
10-14	79 (52.0)
15-20	16 (10.5)
Total	**152 (100)**

Table 6: Degree of haematuria in *S.haematobium* positive urine by age

Age Group	***+No.(%)***	***++No.(%)***	***+++No.(%)***
5-9	26(28.3)	27(51.9)	4(50)
10-14	51(56.4)	24(46.2)	4(50)
15-20	15(16.3)	1(1.9)	0(0.0)
Total	92(100)	52(100)	8(100)

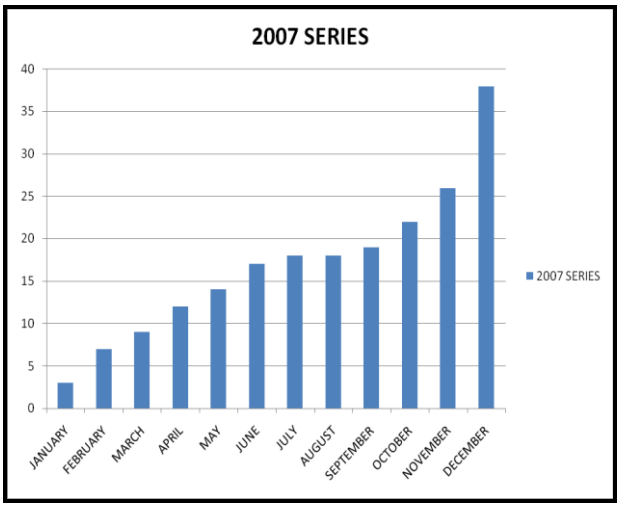

Figure 1: Cumulative incidence (Incidence Proportion) of Schistosomiasis in 2007

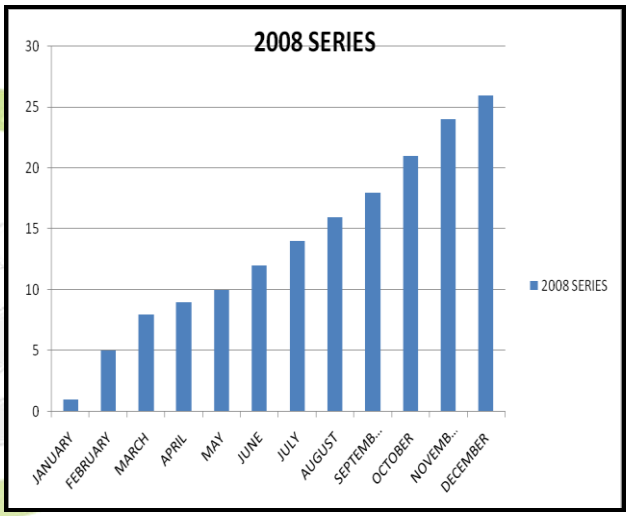

Figure 2: Cumulative incidence (Incidence Proportion) of Schistosomiasis in 2008

DISCUSSION

The overall prevalence and intensity of schistosomiasis reported in this study is well below those previously reported in this area. Based on previous studies in Osun state Nigeria, the overall prevalence of schistosomiasis was thought to be between 40% and 50% in the population although these surveys were limited to one or two communities and perhaps undertaken in the season of high transmission. Certainly the disease is localized in different parts of the state. In the study conducted in Ilie a community in Osun central in 2005 by Amoo and Hassan[11], schoolchildren from 2 schools were screened and the prevalence was 31.7%.

Also Ojurongbe et al.,[12] recorded a prevalence of 37% in 2005 although their study was conducted among pregnant women.

Our survey, representative of all school children in Osun State Nigeria, and undertaken before the commencement of rainy season, suggests lower levels of 12.7% for *S. haematobium* infection. The finding highlights two important features of schistosomiasis. Firstly, these infections are highly localized and secondly they are not common in general. As expected higher prevalence rates were found in Osun central zone. This is due to the presence of river located at Ilie which serves as breeding site for the infection. All the previous published report of schistosomiasis in Osun state was conducted in this area.

There is no consistent pattern attributable to gender and age group with respect to prevalence and intensity of infection in this study. The result unlike the earlier studies shows that the prevalence of the disease is neither age nor sex dependent even though females were more infected in the study. This is presumably due to equal exposure to the risk factor as there were no restrictions on movement and contact with the freshwater habitat in terms of culture, religion, gender or age. Also males were more infected than females in age group 15-20 and had the highest intensity. This observation is not unexpected as boys are generally involved in water contact activities; the recreational aspects which involve bathing and swimming. Also the age group represents the group that are the most active and this observation had earlier been reported that at early age water contact activities are less[13].

The activities increase with growth and maturity. Quantitatively, the overall MEC in the study was 1.5 eggs/10ml of urine. The overall disease intensity was very low compared to what was previously reported in this area and it was due to the reasons already discussed above for the low prevalence. Just like the prevalence among gender, no pattern was also observed for the intensity according to age and gender.

Haematuria was the predominant presenting symptoms (100%) observed among infected subjects, though 50 (32.9%) had macro-haematuria and 102 (67.1%) had micro-haematuria. The highest percentage occurrence of haematuria (52%) was recorded within the 10-14 years age group which is in agreement with the work of Uwaezuoke *et al*., (2006) which recorded the highest percentage of 75.2% for age group 10-20 years in their study though their study was among the communities and not school children as in this study. The presence of haematuria varied with age and a greater percentage of persons within age group 10-14 years had haematuria which can be explained on the fact that they are one of the most susceptible and active age group as a result of re-infection. Also haematuria as observed in this study decreased with age, a phenomenon attributable to the waning of egg hypersensitivity with age[14]. The finding in this study on haematuria conforms to the report of[15,16] who observed a close association between haematuria in urine and the presence of *S. haematobium* ova. It shows that Combi 9 can be used in early and quick detection of urinary Schistosomiasis before subjecting the sample to further screening especially in the case of female older subjects.

The most informative annual incidence is the rate of transmission in an accurately defined cohort of uninfected subjects. The incidence rate indicates the proportion of initially uninfected subjects who become infected during a given period of time, usually expressed as the percentage per year. Incidence rates are invariably measured, in young children, among whom the rate is likely to vary with age. The main importance of incidence studies has been in the monitoring of control programmes aimed at reducing transmission where the reduction in incidence is a measure of effectiveness[17]. Comparing the two incidence studies in year 2007 and 2008, there is a reduction in incidence rate from 25% to 17%. This shows that the endemic area, Ilie where the incidence study was conducted can be free of the infection

through continuous treatment and mass chemotherapy.

The knowledge of the pattern of exposure to infection is essential to an understanding of the epidemiology and successful control of an infectious disease[18] and, in recent years, increasingly complex studies of water contact have been made in endemic areas. In many endemic areas adult women may spend much time in domestic water contact activities like washing clothes, utensils and fetching water. Children may help in these activities, but recreational use of water for swimming and playing is usually of greater importance in younger subjects. Adult males are usually the group involved in occupational exposure as in fishing and farming[17].

CONCLUSION

In conclusion, despite the reduction in the prevalence recorded in this study, urinary schistosomiasis is still a major public health problem and the authorities concerned must tackle it. There is need to urgently provide portable water to rural dwellers to help reduce their contact with rivers that serves as breeding site for the infection as revealed in this study showing domestic water contact as the highest . There should be periodic treatment of school children to reduce intensity of infection and control programme should be monitored by Incidence rate. As shown in this study, reduction in incidence is a measure of effective control.

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