Journal of Helminthology (2004) **78,** 337–342 DOI: 10.1079/JOH2004251

The prevalence, intensity and clinical signs of urinary schistosomiasis in Imo state, Nigeria

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Abstract

Urine samples were assayed for urinary schistosomiasis in four local government areas (LGA) of Imo State, Nigeria between May 1998 and September 2000. A total of 3504 persons were sampled, with 880 (25.1%) being positive for urinary schistosomiasis, based on records of eggs of *Schistosoma haematobium*. The prevalence of *S. haematobium* infection differed in the various LGAs, with Oguta (38.9%) and Owerri-West (10.4%) showing the highest and the lowest values, respectively. Prevalence was higher in males (67.4%) than in females (32.6%) and in subjects 11–20 years of age (31.5%), while prevalence varied among different occupational groups, with farmers ranking the highest (41.6%). Visible haematuria was the predominant symptom ($P < 0.05$). Of 880 persons positive for eggs of *S. haematobium*, 452 (51.4%) had visible haematuria, followed by suprapubic pains 214 (24.3%) and painful micturition 97 (11.0%). Although 367 (10. 5%) of the sampled subjects with eggs of *S. haematobium* showed no visible haematuria, 513 (14.6%) clearly demonstrated haematuria.

Introduction

Schistosomiasis is a life-long chronic disease, attributable to the longevity of the parasite. Morbidity is caused by granulomatous reactions to *Schistosoma* eggs deposited in the tissue and the slow and inefficient development of immunity to this parasite (Chugh *et al.*, 1986). Urinary schistosomiasis caused by *Schistosoma haematobium*, a disease that affects mainly the urinary bladder, is endemic in Africa and the Middle East (Warren, 1973), where it is a disease of socio-economic and public health importance.

While the endemicity of urinary schistosomiasis has been reported for some parts of Nigeria with prevalence values varying widely (Akogun, 1986; Ogbe & Ogunsekan 1989; Anosike *et al.*, 1992; Akogun *et al.*, 1994; Nduka *et al.*, 1995), comprehensive information about the status of the disease in south-eastern Nigeria, especially Imo state, is lacking (Okafor, 1990; Anya & Okafor, 1989; Anigbo & Nwaorgu, 1990). This lack of information on the epidemiology of the disease for the south-eastern states has hindered proper socio-economic evaluation of schistosomiasis and the development of sound control programmes in the area. With recent efforts to control the disease (World Health Organization, 1993), there is the need to establish the status of this disease in the endemic areas of the world including the states of south-eastern Nigeria.

This paper reports the results of a study undertaken between May 1998 and September 2000 to assess the status of urinary schistosomiasis in 37 communities spread across four local government areas of Imo state, Nigeria.

Materials and methods

Study areas

Imo state is situated in the central part of south-eastern Nigeria. The vegetation is typically rainforest type. Two distinct seasons occur, the rainy season, which extends from April to September and the dry season, which runs through the remaining part of the year. Daily temperatures of 27°C to 35°C are usually recorded.

The main ethnic groups in this area consist of Igbos with a few Yorubas and Hausafulani. The Hausafulani are either engaged in trading cattle or minor craftwork. The main occupations of the Igbos include subsistence farming, civil service, trading, tapping of palm and raffia wine and individual business activities. Among the

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Igbos, the tapping of palm/raffia wine and yam, cassava and rice farming are very lucrative occupations, particularly among people who reside along the river basins and in most villages where palm trees and swamplands abound. With the current economic adjustment programmes in Nigeria, many unemployed people in the study area have retired into farming, fishing and palm wine tapping in the villages. The majority of inhabitants in the urban areas live in clustered homesteads due to scarcity of land for settlement. On the other hand, there is a wider spread of settlements in rural areas where swamps and bushes are common features around residential areas. The survey was carried out in four local government areas of Imo state namely Okigwe, Ohaji/Egbema, Oguta and Owerri West.

Parasitological survey

The parasitological survey which was undertaken from May 1998 to September 2000 was preceded by a familiarization tour, during which researchers made themselves known to the village people in the study area, together with local government health centres, community leaders, principals and headmasters of selected schools.

Labelled specimen bottles were used to collect fresh urine samples (Klump & Webbe, 1987), from participants between 0900 h and 1200 h as this period corresponded with the peak of activity when *S. haematobium* eggs are voided with the urine (King, 1973). Bottles were retrieved the same day for laboratory analysis after noting the age, sex and occupation of participants. Urine samples were analysed within 6 h of their collection. Ten millilitres of each sample were centrifuged for 5 min at 2000 rpm and after discarding the supernatant, 0.1 ml of the residue was examined under the microscope for *S. haematobium* eggs.

Egg counts were taken after preliminary identification of eggs with a × 10 scanning objective and × 10 eyepiece (World Health Organization, 1980). Each count, which was multiplied by 2 to give the egg concentration in 10 ml of urine, was repeated three times and the arithmetic mean recorded (Scott, 1957). Individuals with 1–100 eggs per 10 ml urine were considered as having a low infection, 101–400 eggs per 10 ml urine as a moderate infection, while those with >400 eggs per 10 ml urine were regarded as having a high infection. Haematuria was assessed using chemical strips (Medi-Test Combi-9) (Mott *et al.*, 1983), whilst other clinical signs were assessed by personal interviews of participants for each study area.

Statistical analysis

The chi-square (%) test was used to determine the level of in the prevalence of infection, while the Student t-test was used for determining differences in the intensity of infections.

Results

Prevalence of infection

Of 37 communities sampled for the disease 34 (91.9%) were positive. The relative prevalence of urinary schistosomiasis in the four local government areas of Imo State is summarized in table 1. Of 3504 persons examined, 880 (25.1%) were positive for *S. haematobium* ova. Infection rates among the four local government areas differed significantly ($P < 0.05$). The highest infection rate was recorded in Oguta followed by Okigwe, Ohaji/Egbema and Owerri West.

Of 3504 individuals examined during the survey, 2361 (67.4%) were males while 1143 (32.6%) were females. A total of 690 (29.2%) males and 190 (16.6%) females were infected (table 2). Analyses of data using the chi-square test showed that infections in males are significantly greater than in females ($P < 0.05$).

Table 3 expresses the general pattern of distribution of urinary schistosomiasis in relation to age. There was a low prevalence (9.6%) in the oldest age group, i.e. in persons 60 years of age or older (fig. 1). The highest prevalence of 31.5% was recorded in persons between 11 and 20 years of age, whereas more people were infected before the age of 30 years. This mainly represents the active work force in rural communities, thus about 69.1% of all infected persons are within the 0–30 years bracket, showing that the association between urinary schistosomiasis and age was highly significant ($P < 0.001$).

The overall occupation-related prevalence of infection (table 4) shows that of 163 farmers, 738 civil servants, 981 pupils and 822 apprentices/students examined, the most affected occupational group was the farmers (41.6%) followed by apprentices/students while pupils (16.7%) had the lowest infection rate. Analysis of data shows significant differences amongst the various occupational categories ($P < 0.001$).

Intensity of infection

In males, the intensity of infection increased gradually from the 0–10 years age group (fig. 1) where a mean of 53.5 eggs per 10 ml urine was recorded, with a peak of 58.7 eggs per 10 ml, and peaked in the 11–20 years age group. In the females, a similar pattern of intensity was observed. There was a gradual increase in intensity of infection with low prevalence rates, together with a lower mean score of eggs per 10 ml of urine. Overall, prevalence rates were higher in males than in females and the relationship between the prevalence and intensity of infection highly significant ($P < 0.001$). The lowest mean egg counts (27.2 egg per 10 ml urine and 9.5 eggs per 10 ml urine) were recorded in persons 61 years of age or older in males and females, respectively.

Table 1. Prevalence of urinary schistosomiasis in four local government areas, Imo State, Nigeria.

Local government area	No. of communities	No. of subjects examined	No. infected (%)
Okigwe	10	810	125(15.4)
Ohaji/Egbema	9	487	55(11.3)
Oguta	10	1648	642(38.9)
Owerri-West	8	559	58(10.4)
Total	37	3504	880(25.1)

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Table 2. Sex related prevalence of urinary schistosomiasis in four local government areas, Imo State, Nigeria.

	Male		Female	
Local government area	No. examined	No. infected(%)	No. examined	No. infected (%)
Okigwe	559	92(16.5)	251	33(13.1)
Ohaji/Egbema	272	36(13.2)	215	19(8.8)
Oguta	1180	526(44.60)	468	116(24.8)
Owerri-West	350	36(11.7)	209	22(8.1)
Total	2361	690(29.2)	1143	190(16.6)

Table 3. Age related prevalence of urinary schistosomiasis in four local government areas, Imo State, Nigeria.

Age groups (years)	No. of subjects examined	No. infected (%)
1–10	520	120(23.1)
11–20	911	287(31.5)
21–30	677	201(29.7)
31–40	617	156(25.3)
41–50	392	65(16.6)
51–60	251	38(15.1)
>61	136	13(9.6)
Total	3504	880(25.1)

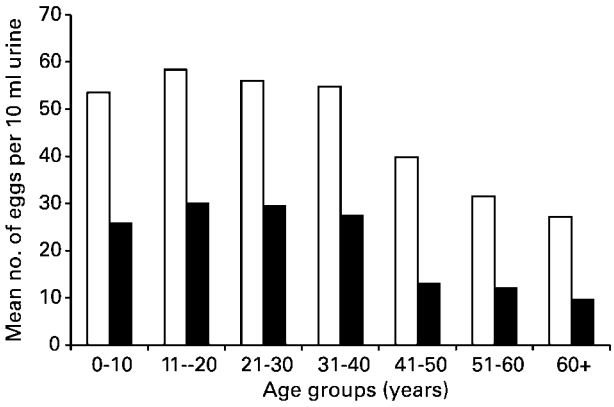

Fig. 1. Sex–age related intensity (mean number of eggs per 10 ml urine) of *Schistosoma haematobium* in four local government areas, Imo State, Nigeria. □, male; ■, female.

Table 4. Occupation-related prevalence of urinary schistosomiasis in four local government areas, Imo State, Nigeria.

Occupational groups	No. of subjects examined	No. infected (%)
Farmers	963	401(41.6)
Civil servants	738	133(18.0)
Schoolchildren	981	164(16.7)
Apprentices/students	822	182(22.1)
Total	3504	880(25.1)

Clinical signs

These include visible haematuria, suprapubic pain, and painful micturition and were assessed among persons harbouring *S. haematobium* ova in their urine (table 5). Of persons positive (+ve) for *S. haematobium* ova, 51.4% had visible haematuria, while 24.3% and 11.0% manifested suprapubic pains and painful micturition respectively. Fifty-two subjects (5.9%) had more than one symptom. On the whole, visible haematuria was the predominant clinical sign ($P < 0.05$).

Table 5. Clinical signs associated with urinary schistosomiasis in four local government areas, Imo State, Nigeria.

Clinical signs	No. examined ($n = 880$)	Prevalence (%)
Visible haematuria	452	51.4
Suprapubic pain	214	24.3
Painful miturition	97	11.0
More than one symptom	52	5.9
None (0)	65	7.4

Discussion

The present study shows that urinary schistosomiasis due to *S. haematobium* is endemic in the four local government areas studied in Imo state, Nigeria. The overall prevalence of 25.1% calls for priority attention for the disease in the health programmes in these areas. This indicates that Imo State belongs to the areas classified by Cowper (1963) as having moderate transmission. The present figure is, however, lower than the 30% reported by Oldenburg (1942) in Owerri, or the 32.4% reported by Anya & Okafor (1989) in neighbouring Anambra state, but higher than that reported by Udonsi (1990), Nduka *et al.* (1995) and Anosike *et al.* (2001) in other endemic foci of Nigeria.

Prevalence rates across four local government areas varied significantly. This disparity is attributable to variations in the degree of exposure to infection, which is influenced by the location of the local government areas and communities and the differential occupations of the inhabitants. It is also likely that the availability of the habitats required for the breeding of the snail hosts are important in influencing the prevalence of the disease in the study areas.

The local government area of Oguta showed the highest prevalence of 38.9% urinary schistosomiasis. This is perhaps expected, as Oguta has several swampy areas for farming activities, including the Oguta lake, which is a breeding site of the snail intermediate host (Udonsi, 1990). Okigwe local government area showed the second

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highest prevalence rate. This area shares boundaries with the endemic areas of Abia State (Nduka *et al.*, 1995; Anosike *et al.*, 2001), which is endowed with fertile soils and accommodates high densities of pulmonate snails, which act as intermediate hosts for *S. haematobium* (Anya & Okafor, 1989).

The total human population examined in the present study seemed somewhat biased relative to host sex. Factors such as the lack of health education in addition to socio-cultural behaviour seemed to have influenced the number of males and females examined. For example, while men willingly participated (67.4%), women tended to remain at home and were not strongly motivated to participate in the survey. This is similar to earlier observations made by Ozumba *et al.* (1989), Amadi (1989), Akogun *et al.* (1994) and Ekanem *et al.* (1995) in other endemic foci in Nigeria where more men than women participated in similar surveys.

The general pattern of urinary schistosomiasis in Imo State showed that a significantly higher proportion of males than females were infected ($P < 0.001$). This overall sex differential was more conspicuous in Okigwe, Oguta and Ohaji/Egbema than in Owerri-West. Similar observations were made by Pugh & Gilles (1978) in Malumfashi in northern Nigeria, by Udonsi (1990) in the Igwun River basin of southeastern Nigeria, by Ofoezie *et al.* (1991) near Abeokuta, Ogun State and by Scott *et al.* (1982) around Volta Lake Ghana. As noted by Udonsi (1990), the apparent male bias in prevalence may be due to the predominantly male participation in swamp rice farming, and thus an overwhelming proportion of water-contact activity was taken up by males.

The age-related prevalence of urinary schistosomiasis observed in the present study appears to be 'biphasic' with a higher prevalence among persons within the 0–30 years age range and a low prevalence in persons 31 years of age or older. This is similar to previous reports on urinary schistosomiasis (Anya & Okafor, 1989; Udonsi, 1990; Verle *et al.*, 1994; Ahmed *et al.*, 1996). Wilkins (1977) also observed an age-related prevalence in a Gambian village and attributed this to a decrease in human water contact and increasing immunity with age. Indeed, the prevalence of human schistosome infections shows a characteristic pattern of variation with age (Chandiwana *et al.*, 1991). The prevalence and intensity of infection are low in young children, rising to a peak in older children and young adults and subsequently declining, often to low levels, among the oldest individuals. This pattern was first observed by Fisher (1934) for *S. intercalatum* in Zaire and has since been reported for different schistosome species in many different geographical locations (Savioli, *et al.*, 1990; Chandiwana *et al.*, 1991; Verle *et al.*, 1994).

At an early age, people in these communities have a high frequency of contact with infected water bodies and a higher rate of exposure enhances the intensity of infection, whilst in older individuals, immunity must have set in, hence the lower prevalence of the disease. This pattern of infection has some practical implications, especially regarding selective mass chemotherapy in these communities. Thus it might be very cost-effective to treat only persons within the first three decades of life in areas where urinary schistosomiasis is endemic.

When considering the intensity of infection, it was observed that the majority of the persons in the study haboured light to moderate infections. The relationship between prevalence, intensity as well as age, gave a similar pattern of *S. haematobium* infection to that previously reported in other parts of Nigeria (Istifanus *et al.*, 1989; Anigbo & Nwaorgu, 1990; Agi, 1995; Nduka *et al.*, 1995). About 68.2% of infected male persons harboured light infections compared with 45.4% of infected females. It is interesting to note that only a small proportion of infected persons (5.2% males and 10.3% females) had heavy infections. This is of practical importance for any attempts at control, since these groups contribute significantly to the potential contamination of the environment in the area. Thus, in any intervention programme, focal attention should be on the most heavily infected, which in most endemic communities comprise persons up to 30 year of age.

Generally, the prevalence of the disease differed widely amongst the occupational groups from the four local government areas. For example, farmers and apprentices/students were significantly more infected than pupils and civil servants. In Nigeria, students/apprentices as well as pupils who make frequent visits to the foci of infection to swim, collect water for domestic uses and for fishing or engage in other water-contact related activities have high prevalence rates.

Fifty-one percent (51%) of all infected persons showed visible haematuria, which is one of the most striking and common manifestations of urinary schistosomiasis (Savioli *et al.*, 1990; Lengeler *et al.*, 1991; Anosike *et al.*, 2001). Suprapubic pains also accounted for about 24% of all infected persons. Similar observations were made by Almeda *et al.* (1994) in the Republic of Sao Tome and Principe, and by Ekanem *et al.* (1995) in south-eastern Nigeria. On the other hand, a smaller proportion of infected persons complained of painful micturition. Again, not all the infected persons showed clinical signs or symptoms of the disease, which is why the recovery of eggs of *S. haematobium* in the urine is considered the most reliable diagnostic criterion for urinary schistosomiasis.

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https://doi.org/10.1079/JOH2004251 Published online by Cambridge University Press

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(Accepted 24 May 2004)