J. biosoc. Sci. (1997) **29**, 9–18 Printed in the United Kingdom

URINARY SCHISTOSOMIASIS AMONG SCHOOL CHILDREN IN NIGERIA: CONSEQUENCES OF INDIGENOUS BELIEFS AND WATER CONTACT ACTIVITIES

U. O. AMAZIGO*, C. I. ANAGO-AMANZE* AND J. C. OKEIBUNOR†

**Department of Zoology and †Department of Sociology and Anthropology, University of Nigeria, Nsukka, Nigeria*

Summary. A study of urinary schistosomiasis in Umueze-Anam, Anambra State, Nigeria, showed a *Schistosoma haematobium* infection of 26% (85) among school children with no significant difference by sex except when age as a variable is introduced. Eleven percent (37) of the 333 children were positive for haematuria; all these 37 children lived within 1·0 km of the water sources. Of the 85 infected children, swimming and laundering accounted for 65% and 48% of all water contact activities, for boys and girls respectively. One-third of the 230 adults interviewed believed haematuria to be a venereal disease and 20% thought it was a sign of maturity. Individual perception of causation and seriousness of haematuria differed by level of education and by sex. Less than 2% of the respondents knew that snails transmitted the disease. The effects of social restrictions on the epidemiology of infection is discussed.

Introduction

Schistosomiasis is a disease complex incorporating several forms that differ but are caused by trematodes of the genus *Schistosoma*. Urinary schistosomiasis is caused by *Schistosoma haematobium* and is a major cause of considerable morbidity, mortality and debility in humans (Parker, 1992). Epidemiological studies show that urinary schistosomiasis is widely distributed in Nigeria (Ukoli, 1984; Edungbola *et al.*, 1987; Audu, 1988; Anya & Okafor, 1989; Akogun, 1991), and has severe clinical complications which include anaemia, cirrhosis, uropathy, ectopic pregnancy, infertility and weight loss (Olufemi, 1967; Cowper, 1973; Okonufua *et al.*, 1990; United Nations, 1990).

Studies in northern Nigeria on water contact activities (Tayo, Pugh & Bradley, 1980) suggest a linear relationship between infection and individual activities. Other studies did not examine water related activities by gender and cultural restrictions. To facilitate effective community participation in control programmes, knowledge of local perceptions about the disease and of cultural restrictions which may be beneficial to control programmes, or which predispose victims to re-infection, are important. The aims of this study were: (a) to determine the relationship of the location of homestead

and water contact activities with prevalence of infection among school children, and (b) to document the influence of formal education and indigenous beliefs on individual perception about causation and seriousness of urinary schistosomiasis.

Materials and methods

Study area

The study was conducted in the Umueze-Anam community area in Oyi Local Government Area in Anambra State, 28 km south-east of Awka, the state capital. Umueze-Anam is located on a strip of land situated on high land overlooking the Anambra River on one side and the Ezichi River on the other. The population of the community is 9500 in an area of 18 km^2. The principal occupation is fishing and about 30% of the inhabitants combine fishing with subsistence farming.

Health facilities available in the community consist of one health centre and eight patent medicine stores. There is no organised water supply system for domestic purposes. The inhabitants thus depend on pockets of small streams and man-made pools for all purposes—bathing, drinking, washing and processing of farm products. The latter two functions are carried out mainly by women, girls and children.

Study population and data collection

Using the cluster sampling method, (WHO, 1991) the community was divided first into three clusters. Because the pupils lived at various distances from the streams, the random method was used to select, from the three clusters, 338 children who lived between 0·1 km and a little more than 2·5 km from the water points. A total of 333 primary school children between 5 and 16 years old whose parental approval was obtained were included in the study. The study population constitutes 10% of the school population in Umueze-Anam.

Distance from the stream/river/pond to school pupil's home was determined by the study team by checking mileage from homestead to the nearest stream or river which the child visits. The most regular time each school child visited a water point for domestic or social activity was learnt through person-on-person interview and recorded.

Types of water contact activities common to school children were documented during group discussions with children and school teachers conducted at preliminary visits to the schools before beginning the main study. The main activities identified were swimming, bathing, fishing, fetching water, washing of clothes (laundering) and utensils, and assisting parents in wetland rice cultivation.

For the main study, information on types of water contact activities for individual children (among those 9 years and older) was obtained through a questionnaire. To determine types of social and domestic activities undertaken by children in streams and rivers before and after school hours, each school child aged 9 years old and over was asked the type(s) of activities he/she undertook every day or every other day, usually as part of domestic chores. Younger children were not included in the assessment of water contact activities because experience in other studies showed that most could not provide reliable answers. They were included in other aspects of the study.

The extent of contact with water was assessed by the type of activity a child performs during periods of maximum shedding of cercariae (12.00–15.00 hours) in

endemic communities in Anambra State (Okafor, 1984). The cercaria are the sexual form released from snails and have to find a human host within a few hours for the life cycle to continue. Participant observation technique was used to gather information on behaviour patterns of school children; for example, the frequency and timing of children's visits to the streams and pools of water were observed and, where appropriate, the subjects were additionally interviewed.

To determine the prevalence of *S. haematobium* infection, urine specimens were provided by each of the 333 pupils and examined microscopically for schistosoma ova using a single modified Kato examination with malachite green stain and the Nuclepore filtration method.

Semi-structured interviews, four group discussions and sixteen in-depth interviews with adults were used to obtain information about their knowledge of the disease, local perceptions about causation, predisposing factors to *S. haematobium* infection and cultural restrictions to water usage. The interviews were administered to 230 adult (18–60 years old) parents/household heads of the 333 children included in the study. To assess local perceptions about the severity of urinary schistosomiasis, adults were asked whether they thought schistosomiasis was 'very serious', 'serious', 'not serious', 'not a disease', and to rank severity. For this study, severity was ranked 'very serious' if the respondent agreed that the disease hampered a person's ability to make progress in life, or if it prevented a mother from carrying out her domestic activities (Herrin, 1988). 'Serious' was defined as perceived impact of the disease on an individual's overall state of health and social relationships within and outside the family. For example, respondents who believe that affected persons are avoided by others because of the impact of the disease on a particular organ, or those who believe it is an outcome of a curse, subscribed to the view that schistosomiasis is a very serious or serious disease. But respondents who believed it a sign of maturity said it is not a disease.

Results

Schistosoma haematobium *infection among school children*

Eighty-five (25·5%) out of 333 pupils examined had *S. haematobium* infection confirmed by the presence of the ova of *S. haematobium* in urine. Fifty-six males (26·1%) and 29 (26·9%) females were infected (Table 1).

Examination of the rate of infection by sex and age showed that among male school children, those between 5 and 6 years of age harboured the highest infection (42%) while girls aged 11–12 years had the highest infection rate (47%). Chi-square test showed no significant difference by sex in the prevalence of infection for children in the same age bracket except for children 5–6 years old ($p = 0{\cdot}04$).

Eleven per cent (37) of the 333 school children had blood in their urine (haematuria), all of whose homes were located within 1 km of the water points. Girls aged 11–12 years, who had the highest rate of infection, constituted 15% of the 37 children with haematuria.

Water contact activities of primary school pupils

School hours in Anambra State for the primary school children are from 8.00 am to 1.30 pm, Monday to Friday. In Umueze-Anam, types of water contact activities

https://doi.org/10.1017/S0021932097000096 Published online by Cambridge University Press

Table 1. Prevalence of infection among pupils in community primary schools in Umueze-Anam, by sex and age

	Males		Females		Total	
Age group (years)	No. examined	No. (%) infected	No. examined	No. (%) infected	No. examined	No. (%) infected
5–6*	41	19 (41·5)	30	6 (20·0)	71	23 (32·4)
7–8	51	9 (17·7)	23	4 (17·4)	74	13 (17·6)
9–10	45	10 (22·2)	19	6 (31·6)	64	16 (25·0)
11–12	35	8 (22·9)	15	7 (46·7)	50	15 (30·0)
13–14	24	7 (29·2)	18	4 (22·2)	42	11 (26·2)
15+	19	5 (26·3)	13	2 (15·4)	32	7 (21·9)
Total	215	56 (26·1)	118	29 (26·9)	333	85 (25·5)

*p significant at $<0{\cdot}05$.

Table 2. Water contact activities of all children (infected and non-infected), aged 9 years and over

	% of all male and female children	
Activity	Boys ($n=123$)	Girls ($n=65$*)
Fetching water	25·2	100·0
Washing clothes/utensils	17·1	92·3
Swimming/playing	70·7	4·6
Bathing	100·0	23·1
Fishing	43·1	9·2
Wetland rice cultivation	47·2	15·4

*Total number reflects unwillingness of parents to allow girls to attend school.
Responses do not add up to 100·0% because some children carried out more than one activity in a day.

undertaken by school children are determined by sex and age. Various domestic and social activities are carried out by children in streams and rivers near their homes. In Table 2, types of activities undertaken by children 9 years old and over are presented.

As shown in Table 2, 71% of the boys swim every day or every other day after school, while only 5% of the girls do so. On the other hand, 21 (17·1%) out of the 123 boys, and 60 (92·3%) of the 65 girls of the same age bracket wash clothes/utensils in water points every day or every other day after school. Although their whole body surface is not immersed in the water the rate of exposure for girls may be similar to or higher than that of the boys. It is important to observe that the data presented in this study were collected during the dry season. Thus, any seasonal variation in the pattern

https://doi.org/10.1017/S0021932097000096 Published online by Cambridge University Press

Table 3. Daily activities of infected male and female school children during peak cercarial shedding period (1·00–3·00 pm)

	Males		Females	
Type of activity	No. infected	No. (%) visiting water point daily, 1·00–3·00 pm	No. infected	No. (%) visiting water point daily, 1·00–3·00 pm
Swimming	24***	22 (91·7)	2	0
Bathing	11***	7 (63·3)	2	2 (100·0)
Laundering/utensils	10	2 (20·0)	12	10 (83·3)
Fetching water	2	0	8	7 (87·5)
Fishing	7	1 (14·3)	3	0
Rice cultivation/ weeding	2	2 (100·0)	2	2 (100·0)
Total	56	34 (60·7)	29	21 (72·4)

***$p < 0{\cdot}001$.

of social and domestic activities of school children which may occur is not reflected in this study.

Domestic and social activities which the 85 infected children carry out at water points between 13.00 and 15.00 hours were recorded to determine the extent of the water contact and the amount of body surface exposed to water during the period of maximum cercarial density. For infected girls, washing of clothes and utensils in streams and river accounted for 47·6% of all water contacts during this time interval. For infected boys, this domestic activity accounted for only 5·9% of all activities ($p < 0{\cdot}004$, Fisher exact). Swimming accounted for 64·7% of all water contacts for infected boys but swimming was not one of the activities of infected girls between 13.00 and 15.00 hours (Table 3). Through participant observation, it was confirmed that girls visiting water points at this period engage in assigned domestic chores.

A higher percentage of infected boys 29 (85·3%) than girls 2 (9·5%) swim and bath in water points between 13.00 and 15.00 hours every day ($p < 0{\cdot}001$). Although all the children (males and females) gave a history of bathing occasionally before or during peak cercarial density, the relative risk of infection for the sexes is different due to social restrictions on females (girls and women). In Umueze-Anam, females 6 years old and above are restricted to bath in the shady sections of the streams and rivers at all times. These areas have been documented as having maximum cercarial density (Okafor, 1984). This social restriction was confirmed by all discussion groups and by school children during interviews.

Prevalence of infection and location of homestead

Distance from home to stream or river is a factor influencing the rate of infection among school children. Figure 1 and Table 4 show that, as distance from home to stream increased from 0·5 km to 2·5 km, percentage prevalence of infection decreased

https://doi.org/10.1017/S0021932097000096 Published online by Cambridge University Press

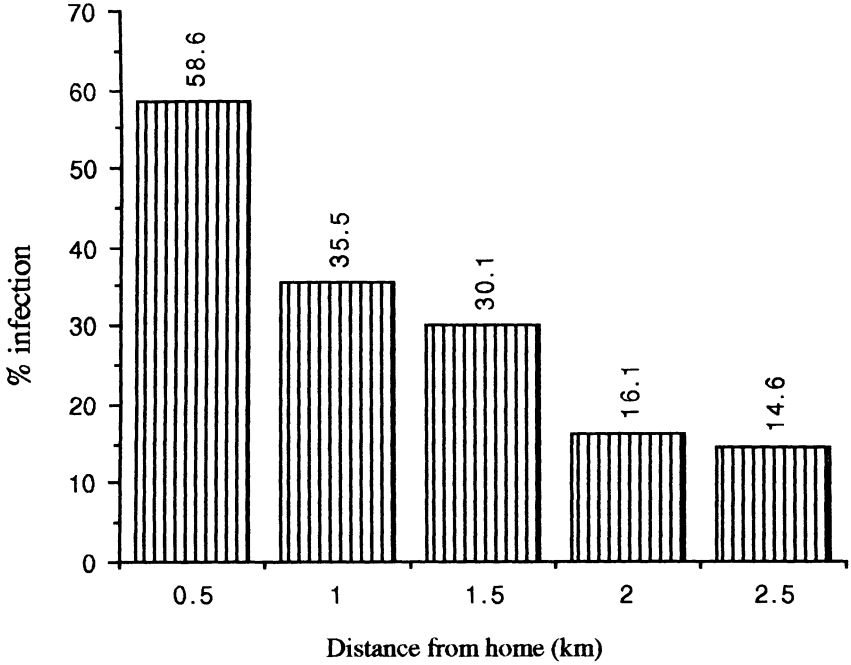

Fig. 1. Relationship between distance of homes from streams and rate of infection.

Table 4. Prevalence of infection among pupils by distance from home to water points

Distance (km)		Pupils		
Actual	Average	No. examined	No. infected	% infected
<0·5	0·3	29	17	58·6
0·6–1·0	0·8	31	11	35·5
1·1–1·5	1·3	103	31	30·1
1·6–2·0	1·8	63	10	15·9
2·1–2·5	2·3	55	8	14·5
>2·5	2·8	53	8	15·1
Total		333	85	25·5

from 59% to 15%. The observed negative correlation between distance to water point and infection rate ($r = -0{\cdot}913$) is significant at the 0·01 level.

Socioeconomic characteristics of adult respondents

Of the 230 adults interviewed, 47·8% and 52·2% were males and females respectively. About 20% (19·6%) were below 30 years of age while 80·4% were above

https://doi.org/10.1017/S0021932097000096 Published online by Cambridge University Press

Table 5. Respondents' opinion on causes of haematuria, by educational level

Opinion on causes	Educational attainment		
	Secondary* ($n=60$) %	Primary ($n=80$) %	No formal ($n=70$) %
Sign of maturity	12·0	40·0	57·1
Happens to everybody	0·0	20·0	14·3
Sign of malaria fever	40·0	18·0	14·3
Outcome of a curse	15·0	17·0	72·9
Effect of witchcraft	0·0	2·0	11·4
Sign of venereal disease	47·5	71·0	58·6
Sign of dirtiness	26·3	9·0	0·0

*Incomplete or complete secondary education.

30 years old. The majority (43.7%) were fishermen, 34·8% were farmers, and 21·6% were traders, teachers and civil servants. Among the respondents, 26·1% had complete or incomplete secondary education, 43·5% had primary education while 30·4% had no formal education.

Knowledge about the cause of schistosomiasis

Schistosomiasis has no local name but haematuria is commonly known as 'Ogbodu'. About one-third (32·6%) of the 230 adults believed that haematuria was a sign of venereal disease, 19·5% were of the opinion that it is a sign of maturity, 17·4% believe it is an outcome of a curse, 13·4% thought it was a sign of malaria fever, 4·1% said it was the effect of witchcraft and 6·5% said it was due to dirtiness. None of the adult respondents linked the disease to water contact activities or to infected snails.

From in-depth interviews and group discussions it was gathered that because infected persons excrete blood in urine, haematuria is believed to be a venereal disease. Females during a group discussion were of the opinion that the presence of blood in female urine is part of menstruation and thought haematuria (Ogbodu) in females was rare.

The level of education of respondents appears to influence their perception of causation of haematuria (Table 5). For example, while a higher percentage (73%) of respondents with no formal education believe haematuria is a curse, only 15% of those with secondary education subscribe to this view. Also, 57% of the respondents without formal education held the view that blood in urine is a sign of maturity and only 13% of those with secondary education held the same view. In general, high proportions (secondary = 48%, primary = 71%, none = 59%) of respondents from each category of educational attainment subscribed to the opinion that blood in urine is a venereal disease.

https://doi.org/10.1017/S0021932097000096 Published online by Cambridge University Press

Table 6. Respondents' perception on seriousness of disease, by level of education

Education	Opinion on seriousness			
	Very serious	Serious	Not serious	Not a disease
Secondary and above ($n=60$)	61·1%	16·3%	13·8%	8·8%
Primary school ($n=80$)	58·0%	22·0%	0·0%	20·0%
No formal ($n=70$)	18·6%	7·1%	14·3%	60·0%

Respondents with no formal education believe that the incidence of venereal disease is dependent on maturity. Thus (Table 5), there is no difference between the percentage of respondents with no formal education who subscribed to the view that haematuria is a venereal disease (59%) and those who agreed that it is a sign of maturity (57%).

Perceived seriousness of haematuria

More than half (55·2%) of the adults believe that haematuria (Ogbodu) from urinary schistosomiasis is a serious disease condition (very serious = 41·3%; serious = 13·9%). While 20·9% are of the opinion that haematuria is not a serious disease condition, 23·9% of the adults do not see it as a disease at all.

Individual perception of the seriousness of haematuria differed by the level of education of respondents (Table 6). Seventy-seven percent of respondents with secondary education consider haematuria a serious disease condition, and only 26% of those with no formal education subscribed to the same view. Furthermore, 60% of persons with no formal education and 9% of those with secondary education believe haematuria is not a disease condition. More females (34·2%) than males (26·4%) were of the opinion that haematuria is not a disease often seen in women.

Discussion groups

From group discussions with women of childbearing age in the community, it was learnt that women in Umueze-Anam believe blood in urine is a disease condition seen in men and not in women, as blood in urine in women is believed to be due to menstruation. A number of beliefs and taboos are held by the community, some of which restrict their movement to streams and rivers. For example, it was learned from group discussions and in-depth interviews that girls (6 years and over) and women in Umueze-Anam are not allowed to swim in the open water but are rather restricted to having their bath in the shady sections of the river/streams. This practice probably affects the level of exposure of females because the snail vectors are known to shed their cercariae in shaded and secluded portions of the streams.

Also, the community has inadvertently evolved or adopted cultural restrictions which protect them from the acquisition of the disease. Though most respondents did not associate the presence of infected snails with the transmission of urinary

https://doi.org/10.1017/S0021932097000096 Published online by Cambridge University Press

schistosomiasis, it is prohibited for anyone to visit the Ezichi river and Iyinkoro streams at about noon. A study by Okafor (1984) showed that these two water points have a higher population of suitable snail hosts (*Bulinus globosus*) than other streams and rivers in the community. It is believed that the goddess of the water will be annoyed and pronounce a curse on the people. This prohibition limits exposure to infection, as maximum shedding of cercariae by the snail host occurs in the afternoon.

Discussion

Umueze-Anam community is endemic for urinary schistosomiasis. In this study a prevalence rate of 26% was found among 333 school children examined. Eleven percent of these children had blood in their urine (haematuria). A positive correlation was found between prevalence of haematuria and distance of water points to homestead. All 37 children with haematuria lived within 1·0 km of water points.

Also, a difference in the prevalence among school children of *S. haematobium* infection by sex is observed when age as a variable is introduced. For example, while the peak of infection for males is found in the younger ages of 5 and 6 years, that of females is between 11 and 12 years of age.

The findings of this study show that gender related activities determine exposure to infection among school children in the community. While social activities (swimming/playing) in streams and rivers during peak cercarial density predisposed school boys to infection, domestic chores (washing clothes and utensils) predisposed girls to infection.

In Umueze-Anam, girls above the age of 6 years and women are not allowed to swim in the open water, but are restricted to the shady sections of the river/streams. This practice must affect the level of exposure of females because the snail vectors shed their cercariae in shaded and secluded portions of the streams. Consequently, girls are more likely than boys to be exposed to infections.

The qualitative findings revealed poor knowledge of urinary schistosomiasis among the people of Umueze-Anam. Schistosomiasis had no specific name but haematuria (Ogbodu) is seen as a male disease because blood in female urine is considered by female respondents as part of menstruation.

Another misconception among the people is about the cause of urinary schistosomiasis: about one-third of all the adult respondents and 73% of those without formal education believe that the disease is an outcome of a curse. Most adults believe haematuria is a venereal disease. These misconceptions have serious implications for willingness to report signs of infections for early treatment, especially among females. Among the Song people in northern Nigeria, haematuria is considered a sign of coming of age (Akogun, 1991) and in this study, 20% of the adults interviewed consider it a sign of maturity.

Social restrictions limit exposure to *S. haematobium* infection, as residents are prohibited from visiting the streams at noon time. This, according to Okafor (1984) is part of the period of maximum shedding of cercariae by the snail host. It is believed that the goddess of the water will be annoyed and pronounce a curse on the people if this restriction is violated.

https://doi.org/10.1017/S0021932097000096 Published online by Cambridge University Press

Acknowledgments

We are indebted to all school teachers in Umueze-Anam who helped to collect the data and to the residents of the villages whose co-operation made the work possible.

References

Akogun, O. B. (1991) Urinary schistosomiasis and the coming of age in Nigeria. *Parasit. Today*, **7,** 62–

Anya, A. O. & Okafor, F. C. (1989) Prevalence of *Schistosoma haematobium* infections in Anambra State, Nigeria. *Bull. F.L.F.A.N.T*, **46,** Ser A, 3–4.

Audu, I. O. (1988) Schistosomiasis: its prevalence in Kaduna Polytechnic, Nigeria. *Trop. Doc.* **18,** 46–47.

Cowper, S. G. (1973) Review: bilharziasis (schistosomiasis) in Nigeria. *Trop. Geog. Med.* **25,** 105–118.

Edungbola, L. D., Asaolu, S. D., Omonisi, M. K. & Adeyedum, B. A. (1987) *Schistosomiasis haematobium* among school children in Babana district, Kwara State, Nigeria. *Niger. J. Sci.* **21,** 40–47.

Herrin, A. N. (1988) Perceptions of disease impacts: what can they tell us: In: *Economics, Health and Tropical Diseases.* Edited by A. N. Herrin & P. L. Rosenfield. University of the Philippines, Manila.

Okafor, F. C. (1984) *The Ecophysiology Biology of the Snail Hosts of* S. haematobium (Bilharz, 1852) *with Observations on the Epidemiology of Disease in Anambra State.* PhD thesis, University of Nigeria, Nsukka.

Okonufua, F. E., Ojo, O. S., Odunsi, O. A. & Odesanmi, W. O. (1990) Ectopic pregnancy associated with tubal schistosomiasis in a Nigerian woman. *Int. J. Gynec. Obstet.* **32,** 281–284.

Olufemi, W. A. (1967) Pathology of schistosomiasis of the uterine cervix due to *S. haematobium. Am. J. Obstet. Gynec.* **98,** 784–791.

Parker, M. (1992) Does schistosomiasis infection impair the health of women? In: *Women and Tropical Diseases.* Edited by P. Wijeyaratne, E. M. Rathgeber & E. St-Onge. IDRC/TDR/WHO, Geneva.

Tayo, M. A., Pugh, R. N. H. & Bradley, A. K. (1980) Malumfashi endemic diseases research project XI: water-contact activities in the schistosomiasis study area. *Ann. trop. Med. Parasit.* **74,** 347–354.

Ukoli, F. A. M. (1984) *Introduction to Parasitology in Tropical Africa*, pp. 52–98. Wiley, New York.

United Nations (1990) *The State of the World Population*, p. 15. UN, New York.