

Full Length Research Paper

Urinary schistosomiasis epidemiological survey of urinary schistosomiasis among children in selected schools: A preliminary study in Minna, Nigeria

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The study was carried out in Minna Metropolis, between August and December, 2005, with a total of 387 school children interviewed and 217 urine samples analysed. This research employs the use of questionnaires, validation of questionnaires by urinalysis and the microscopic examination of the urine samples. The research is aimed at appreciating prevalent level of urinary schistosomiasis in Minna metropolis. The overall prevalence of urinary schistosomiasis, as confirmed by the presence of egg of *SCHISTOSOMA HAEMATOBIMUM* was 12.9%, reported blood in the urine 34.4%, microhaematuria 52.5%, proteinuria 32.7% and red blood cells 24.6%. The frequency of gross haematuria, and the degree of microhaematuria and proteinuria detectable by chemical reagent strips was observed to correlate with intensity of infection. The urinary schistosomiasis prevalence, confirmed by urine microscopy, of 12.9% in the selected school children within Minna, in spite its urban status, suggests that Minna is an endemic area, and the state requires an effective urinary schistosomiasis control programme. A major concern which represents a serious issue in the study includes the very poor level of awareness about the possible cause of urinary schistosomiasis or reported blood in the urine, as only 0.78% of the children have knowledge about the infection and 12% of the children that reported having blood in their urine have visited a health center.

Key words: Prevalence, schistosomiasis, epidemiological survey, proteinuria, microhaematuria.

INTRODUCTION

Schistosomiasis also known as Bilharziasis is a parasitic disease that leads to chronic ill health. It is the major health risk in the rural areas of China and Egypt and continues in other developing countries. Schistosomiasis has been recognized since the time of the Egyptian Pharaohs (WHO, 2004).

Urinary schistosomiasis is caused by *Schistosoma haematobium*; it is a platyhelminthes, a member of the digenetic blood trematodes commonly called blood flukes, in the genus *Schistosoma*. The three main species affecting humans are *S. haematobium*, *Schistosoma japonicum* and *Schistosoma mansoni*. Two other species more localized geographically are *Schistosoma mekongi* and *Schistosoma intercalatum*. In addition other species

which parasitize birds and mammals can cause cercarial dermatitis in humans.

Although, the majority of people in endemic areas have only light infections or no symptoms, the impact of urinary schistosomiasis on economic condition and the general health situation should never be underestimated. The disease also substantially affects children's growth and school performance (WHO update 2004). This has stimulated serious and on going research on developing and evaluating a rapid, efficient and cost effective screening method for diagnosing and identifying prevalent areas of urinary schistosomiasis. According to Mafe et al. (2000) the age groups 5 -19 years has been identified as the target population for nationwide control, in Nigeria, through the School system by Schistosomiasis Work Group (SCHWOG) in Borgu Local Government Area in Niger State.

This research employs the use of questionnaires, va-

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Validation of questionnaires by urinalysis and the microscopic examination of the urine samples for eggs of *S. haematobium*. Furthermore, the urine samples collected from the primary schools was further observed for the presence of red blood cells. This was to distinguish microhaematuria from real haematuria. This will also help to establish the relationship between red blood cells in urine, microhaematuria and the presences of eggs of *S. haematobium*.

The research is aimed at appreciating prevalent level of urinary schistosomiasis in Minna metropolis. It will also help to assess/evaluate the validity of questionnaire, microhaematuria, and microscopic examination of urine for eggs of *S. haematobium* as a necessary tool for mass screening of population for urinary schistosomiasis control programme.

METHODOLOGY

Study area

The study was conducted in Minna metropolis, the capital of Niger State, in the North Central Area of Nigeria. The metropolis spreads across three Local Government areas namely: Bosso Local Government Area (LGA), Minna LGA, and Chanchaga LGA. A total of five schools were used, three Secondary Schools and two Primary Schools.

Minna metropolis has water projects like; the Bosso dam, in Bosso LGA, Tagwai Dam in Chanchaga LGA, and the Niger State municipal water supply project in Chanchaga LGA. Also, swamps/Fadamas scattered all over, for rice farming, and small water bodies were the people, particularly children, visit for swimming or as a source of domestic water due to inadequate water supply.

Sampling

In this study a total of 387 questionnaires were administered. And a total of 217 urine samples collected, from among those that filled the questionnaire. They were given sterile specimen bottles at random to bring their urine samples. The students were advised to collect only terminal urine samples, put them in the hazard bags provided to them, and return immediately. The collections of samples in all the schools were carried out between 10 am and 2 pm. Since this is the period that eggs of *S. haematobium* is more likely to be passed in urine (Lucas and Gilles, 1990). Names of students were omitted and only number codes used on both the questionnaire and specimen bottles. This was to assure the students of confidentiality and clear every suspicion in demanding for their urine samples.

Design of questionnaire

The design of questionnaire considers simple investigative questions or indicators, which include observation of blood in the urine, dysuria, visit to water bodies (risk factor), and time of the events. This probes for a simple knowledge on the sign and symptom of the diseases and also employs the activities that put an individual at the risk of infection.

The use of questionnaire

In the secondary schools, the children were allowed to fill the

questionnaires themselves but in the primary schools the children were assisted by the researcher. According to Ansell et al. (2001) self-diagnosis of urinary schistosomiasis among school children is based on a child spotting blood in their urine, and that the prevalence of infection in a school can be estimated from questionnaires about schistosomiasis. This approach allows testing their ability in identifying their own health problems. Researchers like Mafe et al. (2000) have proposed and investigated indirect screening tools like questionnaire. However, this relies on committed personnel outside the health care sector, but within a well established administrative system like the schools.

Questionnaire validation/urinalysis

Test strips (Medi-test combi 9: Macherey Nagel Germany) was used to test for microhaematuria, proteinuria and other parameters, and the test results classified according to manufacturers instructions as negative, 1+, 2+ and 3+. Wilkins et al. (1979), Mott et al. (1985), Savioli et al. (1989), Lengeler et al. (1993) and Mafe (1997) have reported that the detection of proteinuria and microhaematuria have shown to be reliable in diagnosing urinary schistosomiasis. Though considering other possible causes of proteinuria and haematuria, caution must thus be taken in adapting this approach.

In 1983, the World Health Organization (WHO) in association with the Health Ministries of several endemic countries (Botswana, Egypt, Madagascar, Mauritius and Zanzibar) launched a massive programme to assess control methods of urinary schistosomiasis. The findings of this programme include a suggestion/conclusion that a simple and rapid test for blood in the urine is more reliable than microscopic examination, which can prove difficult in the field (WHO, 2004).

Urine microscopy

This involves the microscopic examination of the urine sediments (after centrifugation) for eggs of *S. haematobium*. The urine samples collected from the primary schools was also observed for the presence of red blood cells. This was to distinguish microhaematuria from real haematuria.

RESULTS

Questionnaire

From the questionnaire, 34.4% of the children responded positively to the question about passing of blood in their urine, while only 0.78% (3 children) has knowledge about urinary schistosomiasis, 12% of those that reported blood in urine said they have visited health center for treatment. The result of the summary of individual school is presented in Table 1. A good percentage of the children (78.3%) responded positively to having contact with water bodies (Table 3).

Urinalysis

From the reagent strip test; the overall prevalence of microhaematuria at 1+, 2+, and 3+ levels are 17.1, 17.1 and 18.4%, respectively, giving a total prevalence of 52.5% (Table 3). Prevalence of urinary schistosomiasis

Table 1. Summary of individual school results.

Name of schools	NS	NQ	RB	MH	PU	ESH	PRB (%)	PMH (%)	PPU (%)	PESH (%)	VW	KS	TR
D	27	93	29	9	8	2	31.2	33.3	29.6	7.4	79	None	4
G	32	92	38	20	12	4	41.3	62.5	37.5	12.5	78	3	9
P	44	76	12	23	6	2	15.8	52.3	13.6	4.5	54	None	1
B	63	66	30	36	28	13	45.5	57.1	44.4	20.6	52	None	None
W	51	60	24	26	17	7	40.0	51.0	33.3	13.7	40	None	2

VW = Visit to water body; NS = no. of samples; NQ = no. of questionnaires; RB = reported blood in the urine; MH = microhaematuria; PU = proteinuria; ESH = eggs of *Schistosoma haematobium*; PMH = prevalence of microhaematuria; PPU = prevalence of proteinuria; PESH = prevalence of eggs of *Schistosoma haematobium*; KS = knowledge about schistosomiasis; TR = visit to health centre for treatment; D = Day Secondary School, Minna; G = Government Secondary School, Minna; P = Police Secondary School, Minna; B = Bosso Primary School, Minna; and W = Waziri Primary School, Minna.

Table 2. Summary of the secondary school and primary school results.

Result	NS	NQ	MH				PMH				PU	PPU (%)	ESH	PESH (%)	RB	PRB (%)	VW	KS	TR
			1+	2+	3+	TMH	1+	2+	3+	PTMH									
SS	103	261	16	25	11	52	15.5	24.3	10.7	50.5	26	25.2	8	7.8	79	30.3	211	3	14
PS	114	126	21	12	29	62	18.4	10.6	25.4	54.4	45	39.5	20	17.5	54	42.9	92	NONE	2

PRB = Prevalence of reported blood in the urine; PS = primary school results;

NS = number of samples; NQ = number of questionnaires; 1+ = low positive level; 2+ = medium positive level; 3+ = high positive level; and SS = secondary school result.

Table 3. Overall schools' result.

NS	NQ	MH				PMH				PU	PPU (%)	ESH	PESH (%)	VW	KS	TR	RBC	PRBC (%)	RB	PRB
		1+	2+	3+	TMH	1+	2+	3+	PTMH											
217	387	37	37	40	114	17.1	17.1	18.4	52.5	75	34.6	28	12.9	303	3	16	28	24.6	133	33.4

PRBC = Prevalence of red blood cells; and RBC = red blood cells.

from the standard method of urine microscopy gave 12.9% (Table 3), and red blood cells observed in the urine samples, collected from the primary school, was 24.6% (Table 2) but prevalence of urinary schistosomiasis in the primary schools using the standard urine microscopy was 17.5% (Table 2).

DISCUSSION

All the 28 samples that showed positive for eggs of *S. haematobium* also showed positive proteinuria (39.4% of total proteinuria in the 217 urine sample – Table 4); and microhaematuria at 3+ level (26 samples) representing 65% of total microhaematuria at 3+ level in the 217 urine sample, while at 2+ level was only 2 samples (Table 2). The presence of both micro-haematuria especially at 3+ level and proteinuria in urine samples should always be further investigated, as this showed a significant correlation with reported blood in the urine as well as the presence of egg of *S. haematobium* in urine. This had been validated by Lengeler et al. (1993) and supported

by Mafe et al. (2000). It also agrees with the proposal of Gordon and Stapleton (2005) that the adolescent with gross haematuria, proteinuria, or microscopic haematuria in combination with other symptoms is more likely to require therapeutic intervention.

The overall prevalence of urinary schistosomiasis in the selected school children as confirmed by the presence of egg of *S. haematobium* was 12.9%; microhaematuria, 52.5%; proteinuria, 32.7%; and reported blood in the urine, 34.4% (Table 3). The high prevalence of urinary schistosomiasis in the primary school (17.5%; Table 2) may be largely due to its location, as it is boarded by small flowing water/stream with vegetation (a risk factor) beside the schools and the age of the children (mostly between 10 – 15 years).

Conclusions

The urinary schistosomiasis prevalence of 12.9% obtained among the selected school children within Minna metropolis, in spite of its urban status, suggests that Minna

Table 4. Urine samples that are positive for eggs of *Schistosoma haematobium*.

Name of schools	MH				PU	ESH	RB	VW	KS	TR
	1+	2+	3+	TMH						
D	Nil	Nil	2	2	2	2	2	2	None	None
G	Nil	1	3	4	4	4	4	4	None	1
P	Nil	Nil	2	2	2	2	2	2	None	None
B	Nil	Nil	13	13	13	13	13	13	None	None
W		1	6	7	7	7	7	7	None	1
Total	Nil	2	26	28	28	28	28	28	None	2

MH = Microhaematuria; and TMH = total Microhaematuria.

is an endemic area, and the state requires an effective urinary schistosomiasis control programme. There is one major concern which represents a serious issue in the study; the very poor level of awareness about urinary schistosomiasis in the study. Only 0.78% responded positively to having knowledge about the infection and 16 out of the 133 school children (12%), that reported having blood in their urine visited health centre. Also, 78.3% of the school children responded positively to visiting water bodies, like streams, this is known to be a risk factor as it harbours the intermediate snail host of the *Bolinus* species. Mafe et al. (2000) reported high prevalence in Borgu Local Government Area in Niger State. The state health ministry in October, 2005 identified an outbreak in Tafa Local Government Area, Niger State, and Wushishi Local Government Area; Niger State had previously been identified by the state health ministry as highest risk community. The entire aforementioned communities have something in com-mon: poor living condition and inadequate water supply. Considering the outcome of this research it is indisputable/necessary that a comprehensive epidemiolo-gical survey of urinary schistosomiasis be conducted in Minna and Niger state at large in other to further identify high-risk communities for proper control programmes. Also, questionnaires and urinalysis can be very helpful.

According to Ansell et al. (2001) the advantages of estimated prevalence of schistosomiasis by the use of questionnaire include quick and easy data collection, relative low cost and the use of non-medica staff. Magnussen et al. (1997) have suggested that teachers could play an important role in schistosomiasis control programme, a point that Mafe et al. (2000) strongly supported and we believe this to be very relevant in urinary schistosomiasis control programmes.

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REFERENCES

- Ansell JM, Guyatt H, Hall A, Kihamia C, Bundy D (2001). Self-reliance-diagnosis of Schistosomiasis in Tanzanian school Children. *Soc. Sci. Med.* 53: 19-21.
- Gordon C, Stapleton FB (2005). Hematuria in adolescents. *Natl. Lib. Med.* 16: 229-239.
- Lucas AO, Gilles HM (1990). A new short Textbook of Preventive Medicine for the Tropics (3rd edition) Edward Arnold: Educational Low-priced Books Scheme (Britain, pp. 127-137.
- Lengeler C, Mshinda H, Morona D, De Savigny D (1993). Urinary Schistosomiasis: testing with urine filtration and reagent sticks for haematuria provides a comparable prevalence estimate. *Acta Trop.* 53: 39-50.
- Mafe MA (1997). The diagnostic potential of three indirect tests for urinary Schistosomiasis in Nigeria. *Acta Trop.* 68: 277-284.
- Mafe AM, Von Stamm T, Utzinger J, Nogoran EK (2000). Control of Urinary Schistosomiasis; an investigation into the effective use of questionnaires to identify high-risk communities and individuals in Niger State, Nigeria. *Trop. Med. Int. Health* 5: 53-61.
- Magnussen P, Muchiri E, Mungai P, Ndzovu M, Ouma J, Tosha S (1997). A school based approach to the control of Urinary Schistosomiasis and helminth infections in children in Matuga, Kenya: impact of a two – year chemotherapy programme on prevalence and intensity of infections. *Trop. Med. Int. Health* 2: 825-831.
- Mott KE, Dixon H, Osein-Tutu E, England EC, Ekue K, Tekle A (1985). Evaluation of Reagent strips in Urine test for detection of *Schistosoma haematobium* infection; a comparative study in Ghana and Zambia. *Bull. World Health Organ.* 63: 125-133.
- Savioli L, Dixon H, Kisumku HM, Mott KE (1989). Control of morbidity due to *Schistosoma haematobium* on Pemba Island: Programme, organization and management. *Trop. Med. Parasitol.* 40: 189-194.
- Wilkins HA, Goll P, de Marshal TF, Moore PJ (1979). The significance of Proteinuria and haematuria in *Schistosoma haematobium* infection. *Trans. Rotoral Soc. Trop. Med. Hygiene*, 73: 74-80.
- World Health Organization (WHO) (2004). Division of Control of Tropical Disease: Schistosomiasis. WHO update October 19.