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An investigation of the schistosomiasis transmission status in Harare

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SUMMARY

A schistosomiasis prevalence and intensity survey was carried out among school children in selected residential suburbs of Harare. Urine and stool specimens were collected for determination of schistosomiasis infection from 2 552 children aged between five and 15 years. A total of 351 (13,7 pc) school children were found to be infected with *Schistosoma haematobium* while 172 (6,7 pc) pupils were found to be positive for *S. mansoni*. The arithmetic mean egg count (AMEC) for *S. haematobium* was 16 while that for *S. mansoni* was 7,6 figures much lower than those found among school children in rural areas.

Malacological studies revealed the presence of infected intermediate hosts of schistosomiasis in some water bodies in and around Harare signifying the potential for transmission. The factors contributing to this observation are discussed. Prevalence and annual incidence of schistosomiasis was highest among children of high density suburbs on the outskirts of Harare where children had access to unprotected and untreated water usually outside the city boundaries. The lack of recreational facilities in these areas was found to be a major contributing factor towards the transmission of schistosomiasis as children were sometimes forced to use water bodies outside the City of Harare boundaries for such activities.

The possible contribution of religious activities is also discussed.

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INTRODUCTION

Schistosomiasis is one of the most common parasitic infections in man and prevalent in 74 countries throughout the tropical and subtropical areas of the developing world. In Zimbabwe, both *Schistosoma haematobium* and *S. mansoni* have been shown to be widely distributed.[1] The assumption that schistosomiasis is mainly a rural problem has been proved invalid in a number of urban settings.[2-6] The severity of schistosomal infections in urban areas has largely been ascribed to poor planning of the cities, lack of available sanitary and recreational facilities and socio-behavioural attitudes of the resident populations.

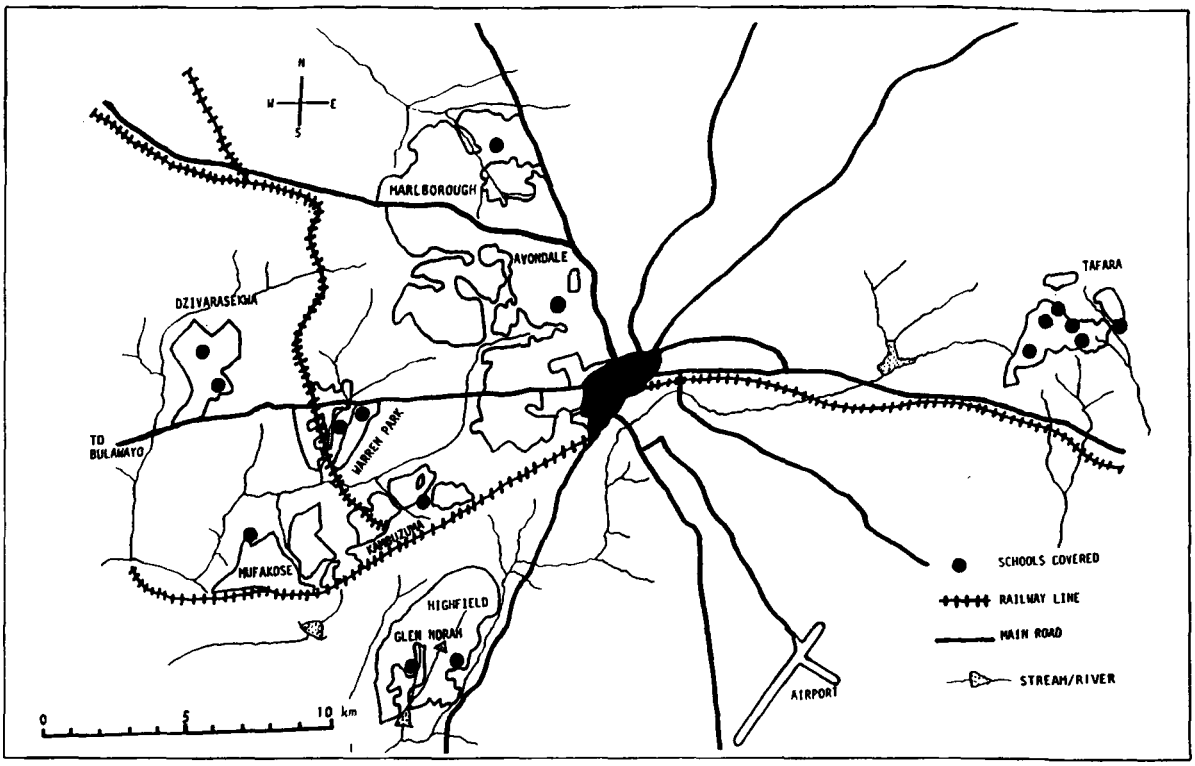
Most of the available data regarding the schistosomiasis problem is based on epidemiological studies that were carried out in rural areas. Fast expansion of cities in developing countries calls for more knowledge to help city health officials minimise the spread of such communicable diseases. This against a background where high population densities create conditions conducive to rapid transmission of diseases. Previous studies have shown that inadequate recreational facilities, poor and sometimes substandard sanitary facilities lead to disease outbreaks as has been seen with cholera in many African cities.

The view that schistosomiasis is a rural problem has resulted in few studies being initiated in Zimbabwe to assess the prevalence and incidence of the disease in urban areas. However, prevalence studies carried out among White school children, whose movements were then confirmed to urban centres, showed infection rates of 18 pc although the source of infection was not determined.[7] The study whose results are presented was conducted between 1991 and 1993 in order to determine the extent of urban schistosomiasis transmission in Harare.

MATERIALS AND METHODS

Study area and population: The study was carried out among school children of selected residential areas of the City of Harare which, at the time of the study, had a population of one million. The city lies on the high veld region of Zimbabwe at an altitude of 1 500 metres above sea level. It receives a mean annual rainfall of 986 mm and has several streams that drain into Cleveland, Hunyani, Prince Edward and Henry Hallan Dams (Figure I). The rainy season is from November to April followed by a dry season from May to October. The annual mean temperature is 25°C.

Figure 1: Map of Harare showing location of the residential areas, streams and dams where the study was undertaken.



Residential areas in Harare are divided into high and low density areas. The majority of the low income earners live in the high density suburbs where the overcrowded conditions, poverty and inadequate recreational facilities increase the frequency of use of natural waterbodies for laundry and other water related recreational activities.

Collection of specimens: Urine and stool specimens were collected between 10.00 in the morning and 12.00 noon when egg excretion is known to be at its maximum. Each child was given two pre-numbered bottles and the name of the individual including grade, age and sex was entered against the appropriate number on a form kept by the investigating team. In one of the bottles, the children were asked to produce a urine specimen and a stool specimen in the remaining bottle for transportation to the laboratory for processing and examination for schistosome ova.

Schistosome ova determination: At the laboratory, the urine specimens were processed for determination of the presence of *Schistosoma haematobium* ova according to the method described by Mott *et al.*[8] Stool specimens were processed according to the modified Kato technique.[9] The slides were kept for at least five days before examination for *S. mansoni* ova. In each case, the eggs were quantified by direct count under the microscope. Each microscope slide was examined independently by three technicians and the mean expressed as eggs/10ml of urine or eggs/gm of stool. The results presented here are based on a single specimen per subject.

Chemotherapy and incidence studies: A questionnaire to assess the child's movements during the last four months was administered to all children that were found infected before being given a single dose of praziquantel at 40mg/kg bodymass. Efficacy of treatment was determined by examining the same children six weeks after treatment and the eggs, if any were tested for viability.[10] Those found excreting viable eggs were given a further doses of praziquantel and examined again after 12 months to determine the incidence of infection.

The questionnaire was re-administered to all children who were found to be re-infected during the second parasitological study to establish the possible sources of infection. Questions solicited information on the movements and recreational activities of the child during the last four months. The names of the rural areas that the child claimed to have visited during this period were noted. The waterbodies used for recreational and other purposes were identified to facilitate correlation of this information with the malacological data.

Malacological studies: Snail studies were carried out by scooping the perimeter of the waterbodies of the catchment area of the suburbs that were included in the study. All the snails that were recovered were speciated and counted. Intermediate host snails were examined for infection by cercarial shedding.[11] Malacological studies were undertaken only once during the dry season when snail populations are known to be highest and schistosomiasis transmission at its peak.[11]

RESULTS

The age prevalence and intensity of *S. haematobium* and *S. mansoni* infection was highest among children aged 10 to 14 years. A total of 351 pupils out of 2 552 examined were excreting *S. haematobium* eggs before treatment giving an overall prevalence of 13,6 pc. Of these, 174 (13,1 pc) were females while 292 (23,8 pc) were males. *S. mansoni* infection was detected in 172 (6,7 pc) pupils 384 (28,9 pc) of them females and 177 (14,4 pc) males. The age related prevalence of infection is shown in Table I.

Results of parasitological examination of school children resident in various suburbs where prevalence of *S. haematobium* infection varied from 4 pc to 67 pc are shown in Table II. The mean *S. haematobium* egg output was 16 eggs per 10 ml of urine while that for *S. mansoni* was 7,6 eggs per gram of stool. However, annual incidence varied from 0 pc to 14,3 pc and was highest among children from Tafara. During specimen collection, blood in urine was frequently detected especially among those children from the high prevalence areas of Tafara and Mabvuku. However, the incidence of *S. mansoni* was 0 among all the school children.

Asked about their movements during the last four months 32 pc of the children found infected during the second examination claimed not to have left the city. The majority were resident in the Tafara and Mabvuku area (Figure I). However, when asked about their water related activities, most of the children claimed to use unprotected and untreated waterbodies for recreational

Table I: The age related prevalence and intensity of infection among school children in Harare 12 months after chemotherapy. Figure in brackets indicates the number of children that fall in the indicated category.

Age groups	Number examined	Intensity of infection *S. haematobium*				*S. mansoni*			
Males	n	1–50	51–100	101+	Total	1–23	24–50	51–100+	Total
5–9	375	22,1	0,8	0	22,9	2,4	0	0	2,4
10–14	838	19	3,6	1,3	23,9	16,7	3,3	0	20
15+	12	50	0	0	50	0	0	0	0
Total	1 225	20,3	2,7	1,3	23,8	12,2	2,3	0	14,4
Females									
5-9	440	14,8	1,4	0,7	16,9	7,5	0	0	7,5
10–14	878	8	1,0	2,5	11,2	35	5	0	40
15+	9	22,2	0	0	22,2	0	0	0	0
Total	1 327	10,3	1,1	1,9	3,1	25,6	3,3	0	28,9

Table II: Prevalence and incidence of schistosomiasis among children and snail infection rates of suburbs of Harare.

Location of school in Harare	n	*S. haematobium* prevalence 1st exam	2nd exam	Incidence	Pc infected in Harare	Number of *Bulinus globosus* recovered	Pc of snails that were infected
Glen Norah	450	11,6	2,4	2,7	11,20	12	0
Mabvuku	374	12,3	5,9	6,3	27,80	8	0
Tafara	434	66,2	4,8	14,3	36,20	178	35
Kambuzuma	184	6,5	0	0	7,30	58	0
Mufakose	182	4,4	0	0	12,50	58	0
*Marlborough	202	4,0	0	0	0,50	60	0
*Avonlea	198	3,0	0	0	0,00	0	0
Dzivarasekwa	327	3,0	4,6	6,7	5,60	34	4,6
Warren Park	201	6,5	2,5	2,7	14,80	95	3,2
Total	2 552	20,8	2,9	2,9	15,50	503	5,0

Schools located in low density residential areas. n= number of school children examined.

activities. This was most evident in the Tafara and Mabvuku areas where the children claimed regular water contact through swimming in a dam situated in the nearby commercial farm but outside of the city boundaries.

Malacological studies: A large number of *Bulinus globosus* were recovered from waterbodies in the catchment area of all the study suburbs except from Avonlea. However, only those snails that were recovered in the waterbodies in and around Warren Park, Tafara and Mabvuku shed human cercariae identified using electrophoresis. No *Biomphalaria pfeifferi* were recovered from any of the waterbodies.

DISCUSSION

Although in most developing countries, schistosomiasis is a problem of the rural areas, the rural to urban migration has resulted in the introduction of the problem into the urban centres. The results of this study have demonstrated that although schistosomiasis is not a major cause of morbidity in Harare, the lack of recreational facilities in some high density suburbs aggravates the problem as children are forced to use natural waterbodies which in some cases are outside the city boundaries.

The 13,6 pc overall prevalence of *S. haematobium* among pupils from the 12 primary schools surveyed in Harare was low compared to the prevalence found in rural areas.[1] These results conform with those of similar studies carried out elsewhere[2,3,4] which showed significant schistosomiasis transmission in urban areas but at lower rates than in rural areas.

Although the City Health Department's vector control unit has a programme for monitoring, among other things, the schistosomiasis vector snail population and molluscicide where necessary, this exercise is not always exhaustive and is confined to the city boundaries. This, coupled with industrial wastes and sewage that usually find their way into the river systems of the city could account for the high number of dead snail shells found during the malacological studies. But, the recovery of infected intermediate host snails signifies that even with these control efforts and practices undesirable for snail breeding and survival, a reservoir of infection still remains.

It is evident from the results that *S. haematobium* infection was more prevalent than *S. mansoni*. The reasons for the high prevalence of *S. mansoni* among female children compared to males in not apparent particularly in light of our failure to recover any *Biomphalaria pfeifferi* during the malacological studies. Failure to detect any cases of re-infection due to *S.*

mansoni a year after chemotherapy suggests that most of the *S. mansoni* cases seen during the first examination were probably imported from other areas. In any case the nature of *S. mansoni* infection is such that one can go for years harbouring the infection without seeking treatment largely due to the general ignorance about this type of infection.[12] It is therefore likely that the *S. mansoni* cases might be very old infections that may have been contracted in rural areas.

Results from the questionnaire forms suggested that while most of the children may have contracted the disease from natural water bodies in rural areas, a significant proportion (32 pc) of those that were re-infected claimed not to have left the city. The high prevalence and incidence figures from Mabvuku, Tafara and Dzivarasekwa could be attributed to the close proximity of commercial farms to these suburbs. This is particularly evident in Tafara and to a lesser extend, Mabvuku where the children used the highly infectious dam in the nearby farm for fishing and other recreational activities. During the malacological studies, a large number of infected snails were recovered from this dam which is outside the City of Harare boundaries.

It is noteworthy that, unlike other high density suburbs of Mbare, Highfield and Mufakose in Tafara, Mabvuku and Dzivarasekwa no public swimming pools have been provided, a factor that might contribute to the high prevalence and incidence of infection found in these suburbs. Further, some of the waterbodies, although swampy and unsuitable for human water contact activities, had infected intermediate host snails. The contribution of religious meetings, a frequent activity, particularly during the weekends, should not be overlooked.

The finding that incidence was relatively high among school children in some local areas such as Tafara indicates the need to intensify health education regarding schistosomiasis among the children. Although chemotherapy could reduce the intensity of infection, the benefits accruing become difficult to sustain without adequate health education. It is curious to note that during the study, most clinics in these residential areas had no anti-schistosomal drugs, a possible indication of the low ranking of schistosomiasis by the City Health Department. It is appreciated that although there might be patchy and scattered transmission occurring elsewhere in Harare, the focal nature of schistosomiasis transmission[13] evident in the Tafara/Mabvuku area where incidence rates were similar to those found in rural areas, clearly suggests the need for concerted action in certain localities. The results further highlight the need for provision of public water related recreational facilities in order to reduce the chances of transmission of water borne disease within the city boundaries.

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