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Distribution of urinary schistosomiasis among school children at elkeriab and tayba elkababish villages, East Nile Locality, Khartoum State, Sudan

Abstract

Introduction: Schistosoma infection is a one of the main infection in the tropics and sub tropics, from a global public perspective Schistosoma is the most important water based disease, only second to malaria among the parasitic diseases with regard to the number of people infected and those at risk. The reported incidence of *S.haematobium* in Sudan is between 0-20%.

Methodology: this is a descriptive cross sectional study, we screened all the school aged children from the two villages of Elkeriab and Tayba Elkababish in the East Nile locality, Khartoum state; for *S.haematobium*, by examining the urine, using wet preparation and filtration technique.

Results: 1205 school children were screened for *S.haematobium*, 105(8.7%) tested positive for Schistosoma, the infection rate was more in Tayba Elkabish compared to Elkeriab (p value=0.01) and in male more than females (p value =0.01).

Conclusion: *S.haematobium* infection is still a common infection in school ages children, in rural and irrigated schemes, mainly affected males. Schistosoma control programs have reduced the prevalence of *S.haematobium* infection but still there is a long road towards eradication of Schistosoma.

Keywords: malaria, schistosomiasis, parasitic diseases, agricultural populations

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Background

Schistosomiasis; also known as bilharzia, is a parasitic disease prevalent in tropical and subtropical regions, caused by trematodes of the subclass Digenea, super family Schistosomatoidea and genus Schistosoma. More than 15 species of Schistosoma have been reported in humans, but the major agents in causing human infections are *S.mansoni*, *S.heamatobium* and *S.japonicum*.[1] Schistosoma is the most important water-based disease from a global public perspective. schistosomiasis is ranked second only to malaria among the parasitic diseases with regard to the number of people infected and those at risk.[2] According to WHO, schistosomiasis is endemic in 76 countries and territories, about 95% of the cases are in Sub Sahara Africa,[2] there is a significant association between poverty and schistosomiasis; infection is higher in countries with limited health resources.[3] Schistosomiasis tend to affect school-aged children, adolescent and young adults.[4] In 2009,The World Health Organization had estimated that 239 million people were infected with Schistosoma.[5] Globally, there are 150,000 deaths per year that are attributed to Schistosoma infection.[6] Schistosoma is primarily a disease of tropic and subtropic regions, this reflects the distribution of their intermediate host species of snails.[1]

It has become a serious public health and socio-economic issue in Sudan.[7] The reported prevalence rate of *S.haematobium* in Sudan is between 0-20%.[2,8] Schistosoma is widely distributed in Sudan; Estimated at around Five million people requiring treatment whom are mostly children. Schistosomiasis greatly affects poor and rural communities, particularly agricultural populations. Inadequate hygiene and contact with infected water make children especially vulnerable to infection.[9] In Sudan, and according to the WHO, the number of people treated for the disease in 2011 was 2,281,000 and those are in actual need treatment were 5,820,000.[10] However, this number has increased especially after the spread of the disease to other regions that are not considered to be inhabited with the disease such as Khartoum state, Northern Kurdufan and some parts of Southern Darfur[11] due to the expansion in water resource development and increased population movement.[12,13] WHO recommends preventive chemotherapy (PC) consisting of periodic administration of Praziquantel for schistosomiasis as a short-term measure for the control of morbidity associated with schistosomiasis.[14] PC for schistosomiasis is required in 52 countries for a total of 219. million people; 60 % of whom are school-aged children.

The goal of WHO is to treat at least 75% of school aged children in all schistosomiasis-endemic countries by 2020. In 2017, 98.7 million people (81.8 million school aged children and 16.9 million adults) received PC for schistosomiasis.

In 2017 the preventive chemotherapy cover in Sudan was reported than that of WHO's goal.[14] The El-Selit irrigation scheme was established in the late 1980s in the East Nile locality of Khartoum State; From the early 1990s, a new focus of *S. haematobium* had been identified in the area;[15] El-Selit is irrigated by surface canals coming from the Blue Nile river. Living in close proximity of dams or surface irrigation schemes is one of the highest risk factors for Schistosomiasia.[2] Elkeriab and Tayba Elkababish villages are in the locality of El-Selit scheme.

Objectives

This study is aimed at estimating the distribution of urinary schistosomiasis among school children in East Nile locality, Khartoum State and identifying the risk factors relating to *S.haematobium* infections.

Methods

This was a descriptive cross-sectional study conducted among primary-schools children in Elkeriab and Tayba El kababish villages. All the primary-school children in the two villages were tested for Schistosoma heamatobium ova in urine samples, using wet preparation and the filtration technique.

Inclusion criteria: all the children who attended the primary schools in these two villages were included in the study. Children who were known to have Schistosoma, or received Schistosoma treatment in the last six months prior to the study were excluded from the study. For the detection of Schistosoma haematobium ova we used a reusable monofilament polyamide (Nytrel) filter to filter the urine samples; as described by Mott et al.,[16] we used this method as it is recommended by the World Health Organization[17] for the qualitative and quantitative diagnosis of *S. haematobium* infection. This method has been used extensively in field studies on the epidemiology and control of urinary schistosomiasis. Statistical Analysis Statistical Package for the Social Sciences (SPSS) IBM, Version 22 was used. Students; t-test were used to identify statistically significant differences.

Ethical consideration: The study was approved by Khartoum State Ministry of Health. School administration officials in the locality, school headmasters and teachers were informed on the study and informed consent was obtained from the families of all the children who participated in the study.

Results

From the 1205 school children were examined for evidence of *S.haematobium* infections in the two villages:105(8.7%) school children showed evidence for *S.haematobium* infection (Table 1). The infection rate among boys was significantly higher than when compared to girls, 103 out of the 616(16.7%) boys examined showed evidence of *S.haematobium* infection , while only 2girls out of the 589 (0.3%) showed evidence of *S.haematobium* infection (P value=0.01) (Table 2). There was a significant difference in the distribution of the disease between the two villages: in Elkeriab village, 45cases (5.4%) out of the 830 school children examined had showed evidence of *S.haematobium* infection. In Tayba Elkababish, 60 cases (16%) out of the 375 school children examined showed evidence of *S .haematobium* infection (P Value=0.01) (Table 3). There was a significant difference in the age distribution of *S.haematobium* infection; the prevalence of the disease according to age was 6 out of 382(1.5%), 33 out of 317(10.4%), 40 out of 272 (14.7%) and 26 out of 234 (11.1%) in the age groups 6-8years, 8-10 years, 10-12years, 12-14years respectively (P value=0.04) (Table 4).

Discussion

The total prevalence rate of *S.haematobium* infection is 8.7 %, lower than the majority of the previous studies.[17] A Study by Ismaiel et al.,[18] in the White Nile state had showed a 45% prevalence of *S.haematobium* whereas a study by Ahmed et al.,[19] in the River Nile state showed a prevalence of 51.4% of *S.haematobium* infection and in South Darfur by Deribe et al.,[11] had showed *S.haematobium* prevalence of 56%. Historically in Sudan, Schistosmiasis was only known in Gezira irrigation scheme,[2] but has been identified recently in other areas including in the El-Selit irrigation scheme.[15,18] A study by Abdien[20] examined 1426 residents in the same area including children and adults, It found a total *S.haematobium* prevalence of 23.7% with 39.6% prevalence in school children. A Study by Mohamed et al.,[15] in Elkeriab village examined 346 children and had found 97 children (28%) infected with *S.haematobium*. From observation of the two studies, it seems the prevalence of *S.haematobium* infection is decreasing; this could be attributed to the success of the implemented measures.

Table 1 Distribution of urinary schistosomiasis in Tayba Elkababish and Elkeriab Schools

Village	Number examined	Tested Positive for *S.haematobium*
Elkeriab (Boys)	405	60 (14.8%)
Elkeriab (Girls)	425	0 (0%)
Tayba Elkababish (Boys)	211	43 (20.3%)
Tayba Elkakbish (Girls)	164	2 (1.2%)
Total	1205	105 (8.7%)

Table 2 Distribution of urinary schistosomiasis among schools children according to sex

Sex	Number examined	Tested Positive for *S.haematobium*
Male	616	103(16.7%)
Female	589	2(0.3%)
Total	1205	105(8.7%)

Table 3 Distribution of Urinary Schistosomiasis according to the Village

	Urinary schistosomiasis		Total
	Positive	Negative	
Elkeriab Village	45	785	830
Tayba Elkakbish	60	315	375
Total	105	1100	1205

P value=0.01.

In the study that we have conducted, there was a significant difference in the prevalence between the two villages; the prevalence rate was found to be 5.4% in Elkeriab and 16% in Tayba Elkabish. Surprisingly, the study by Abdien[20] showed a higher *S.haematobium* prevalence in Elkeriab (22.9%) than in comparison to Tayba (11.7%), the reasoning for this difference may be due to the fact that their study included adults and children; In our study, only school children are taken into consideration; Tayba Elkabish school is very close to a *S.haematobium* infected water.

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Table 4 Distribution of Urinary Schistosomiasis infection according to age

Age Group (Years)	Positive	Negative	Total
6 -< 8	6 (1.5%)	376	382
8 -<10	33 (10.4%)	284	317
10 -< 12	40 (14.7%)	232	272
12 -<14	26 (11.1%)	208	234
	105	1100	1205

P value=0.04.

According to gender, the distribution of the Schistosoma heamatobium infection showed higher significant difference between boys and girls. The prevalence was higher among boys (16.7%) than girls (0.3%). A Study in the same area[20] showed statistically different prevalence between males and females; male prevalence was 30.7% while female prevalence was 14.9%. Similar to our study, most of schistosomiasis studies from Sudan showed that infection was found more frequently among males than in females.[13,19,20] This may be attributed to boys being more exposed to activities that involve contact with infested waters; the cultural and social beliefs state that females are not allowed to participate in swimming activities, especially in the public areas. The highest age group to be affected is 10-12year olds with a prevalence of 14.7%, while the lowest is 6-8year olds with a prevalence of 1.5%; 6–8year olds are new to the school and relatively shy and hence do not have the confidence to go partake in swimming unattended.

Conclusion

S.haematobium infection is still a common infection in school-aged children in rural and irrigated schemes, especially affecting males. Schistosoma control programs have reduced the prevalence of *S.haematobium* infection but there remains a lot to be desired when concerned with the eradication of Schistosoma. Health education should be stressed to all children in schools to increase the awareness of the disease and the dangers of water-contact activities.[21,22] Other measures should also be implemented and monitored such as removing snail hosts in endemic area, mass screening, large scale treatment with Praziquantel[23] as well as permanent improvement in water supply and sanitation.[24]

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Conflicts of interest

The authors declared there is no conflict of interest.

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