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The Prevalence of Urinary Schistosomiasis among the Abo-Matariq Population, East Darfur State, Sudan

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Abstract

This cross-sectional study was conducted in Abo-Matariq area in East Darfur state on 570 individuals (370 males and 200 females) to determine the prevalence rate of *Schistosoma haematobium* and to evaluate two diagnostic methods (sedimentation and filtration techniques). The study was carried out during the period between February 2018-April 2018, urine samples were taken from the subjects. The study showed that the overall prevalence rate of infection was 20.2%, all positive cases (115) out of 570 were detected by using urine sedimentation and filtration techniques.

Males have reported a higher rate of infection than females (15.8% and 4.4% respectively). The highest infection rate of 15.6% was reported among the age group of 11-20 years, while there was no positive case reported among the 31-40 and over 40 years age groups. The study showed that among 115 positive cases, 107 (18.8%) had direct contact with water and 8 (1.4%) had no contact with water. Also, the study showed that among 115 positive cases 100 (17.6%) had haematuria in their urine while 15 (2.6%) had no haematuria in their urine. The study showed an equal detection rate for both techniques used.

Keywords: Prevalence; *Schistosoma haematobium*; Abo-Matariq; East Darfur state

Introduction

Hundreds of millions of people do not enjoy a healthy, productive life because they are debilitated and unable to achieve full potential. Parasitic infections contribute significantly to this widespread deprivation. Soil-transmitted helminths and schistosomes are the most common infections worldwide. Two billion people are chronically infected with soil-transmitted helminths and schistosomes. Many suffer from severe morbidity and others from more hidden manifestations of diseases. Almost, all cases occur in areas of poverty in low-income countries in the tropics and subtropics [1].

Worldwide, five species of schistosomes are able to infect man [2]. These are *S. haematobium, S. mansoni, S. japonicum, S. intercalatum,* and *S. mekongi*. Of these five species, the first three are the most important. *S. haematobium* is the causative agent for urinary schistosomiasis. The other species cause intestinal schistosomiasis and affect the intestine, liver, and spleen, and can be fatal [3]. Symptoms and signs of the infection are quite affecting both the health and social status of the individual, especially children. On the other hand, the disease is basically associated with terminal haematuria, which may lead to anemia due to chronic blood loss. The seriousness of the complications of the disease such as cancer of the bladder and secondary bacterial infection prompted a thorough investigation of the disease, especially in the endemic areas. There are many ponds and swamps found in the area and that created a suitable environment for *Schistosoma haematobium snail (Bulinus) and the infective stage (cercaria) to exist leading to the infection with Schistosoma haematobium.* Intestinal schistosomiasis caused by *S. mansoni* is found in Egypt, Libya, Oman, Saudi Arabia, Sudan, and Yemen [4]. 8 million people are infected by schistosomiasis in Sudan (5 m) and (3 m) Yemen [4].

In Sudan, the first epidemiological survey by Blue Nile health project (BNHP) in Aljazeera Irrigated Scheme (AIS), showed overall prevalence rate of schistosomiasis to be 51%, ranging between 30% and 70% [5]. Urinary schistosomiasis was reported in Darfur and Kordofan provinces. Wright [6] estimated that urinary schistosomiasis ranged between 9% in Darfur and 35% to 47% in Kordofan. These figures were confirmed by other studies [7,8]. In Khartoum state, a marked increase in their prevalence was reported after the extension in the irrigated areas around Khartoum [9]. In certain villages in Sharg Alneel [10] reported an overall prevalence rate of 9.9% which reflects the impact of the extensions of irrigated areas around Khartoum North. During 14-month study [11], 128 765 Bulinus truncates snails were collected from canals located near four villages in the northern part of the Gezira irrigated areas and were examined for patent trematode infections, by exposure to light. In all, 903 shredded cercariae, of which 424 were identified as *S. haematobium*, and the highest density of snails was

found between March to May while the peak of snail infections occurred from June through August. One village, Bashagra, was the source of 80% of these *S. haematobium* infections. The residents of the four villages and any adjacent small camps were examined for infection with *S. mansoni* and/or *S. haematobium* by collecting and examining stool and urine samples. The overall prevalences were 50% for *S. mansoni* and 20% for *S. haematobium*. A survey conducted of schistosomiasis among school children in 2 villages in southern Sudan. In Lui (west Equatoria region), the prevalence of *S. mansoni* infection was 51.5% and no cases of *S. haematobium* was detected. In Nyal (upper Nile region), the prevalence of *S. haematobium* infection was 73% and *S. mansoni* infection was 70%.

Bakhit [12] studied the association, if any, between *S. haematobium* infection and bacteria in Kerry village. The study revealed that the overall infections rate was 25% (78 out of 312 urine sample examined). The prevalence in females was higher than that of males (34% and 22% respectively). The highest infection rate (30%) was reported among the 11-20 years age group while no infection was found among the 21-30 years, age group.

Mohammed [13] studied schistosomiasis in Assalaya camps, White Nile state. He examined 447 basic school pupils. He found that overall prevalence of *S. haematobium* was found to be 21% with a mean of 50 eggs per 10 ml of urine and prevalence of *S. mansoni* was found to be 19% with a mean of 100 eggs per gram of feces. The prevalence was found to be higher in males than females and the most infected age group was 10-15 years.

Ahmed [14] studied the prevalence of schistosomiasis in Omaha village in White Nile state. In this study, stool samples were collected from 200 individuals (106 males and 94 females) and urine samples from 200 individuals (106 males and 94 females). The overall prevalence of *S. haematobium* and *S. mansoni* were found to be 10.5% and 0% respectively. For the positive cases of *S. haematobium*, the age group 6-16 years had the highest rate of prevalence (57.1%).

Material and Methods

Study design

It is a cross-sectional study.

Study area

The study was conducted in Abo-Matariq area in East Darfur state. Abo-Matariq is located south to AL Deain about 35 kilometers (10°-13°′ ′ N and 25°-27°′ ′ E). Water source in the area consists of temporary water pools and permanent pools. Population activity constitutes herd owning of cattle and sheep, kept on shifted grazing and rainfed cultivation farmer.

Study population

The study was conducted on 570 persons living in Abo-Matariq area. The population were categorized according to gender (370 males and 200 females) and was divided into 5 age groups (1-10, 11-20, 21-30, 31-40 and over 40).

Study period

The study commenced in February 2018 and ended in April 2018.

Data collection procedures

A questionnaire was designed to collect data on socio-demography and related factors.

Sample collection

570 urine samples were collected in sterile wide-mouth containers.

Methodology

Sedimentation technique

Ten ml of the urine sample was centrifuged at 2000 rpm for 5 minutes, and the sediment was then examined microscopically for each individual for the presence of *S. haematobium* eggs under the lower power 10X [15].

Filtration technique

Ten ml of urine was collected in a plastic disposable syringe, and was then passed through the filter which was held in a filter holder, and then the filter holder was removed and unscrewed by using blunt ended forceps to remove the filter and then covered with cover glass and examined for the presence of *S. haematobium* eggs under the microscope [15].

Statistical analysis

Data collected were analyzed using Statistical Package for the Social Sciences (SPSS) software. Statistical analysis was done using Chi-square to evaluate any association between *S. haematobium* infection. Observed differences in data were considered significant and noted in the text if $p<0.05$.

Results

The result revealed that out of the 570 urine samples collected from Abo-Matariq area in East Darfur state, 115 samples were found positive for *Schistosoma haematobium* using the two techniques (sedimentation and filtration). This constituted an overall prevalence rate of 20.2% (Table 1). The results showed an equal detection rate for both techniques used.

Method	Total examined	Positive cases	Negative cases
Sedimentation technique	570	20.2% (115/570)	79.8% (455/517)
Filtration technique	570	20.2% (115/570)	79.8% (455/517)

Table 1: The prevalence of *S. haematobium* by using two different methods among the study population.

The study population comprised of 370 males and 200 females. The prevalence rate among males was found to be 15.8% and 4.4% was found among females (Table 2). The difference in rates was found to be statistically significant at $p=0.0001$.

	No. examined	No. positive	Prevalence rate	p-value

Gender	Male	370	90	15.80%	0.0001
	Female	200	25	4.40%	
	Total	**570**	**115**	**20.20%**	0.0001
Age groups	1-10	95	19	3.40%	
	11-20	350	89	15.60%	
	21-30	89	7	1.20%	
	31-40	15	0	0%	
	Over 40	21	0	0%	
	Total	**570**	**115**	**20.2**	

Table 2: The prevalence of *S. haematobium* according to gender and age groups using the sedimentation method.

For age groups, the highest prevalence rate was 15.6% reported among the 11-20 years age group, while there were no positive cases reported among the 31-40 and over 40 years age groups (Table 3). The difference in rates was found to be statistically significant at p=0.0001. 107 (18.8%) of the positive cases had direct contact with water and 8 (1.4%) had no contact with water (Table 4). The difference in rates was found to be statistically significant at p=0.0001.

		No. examined	No. positive	Prevalence rate	p-value
Gender	Male	370	90	15.80%	0.0001
	Female	200	25	4.40%	
	Total	**570**	**115**	**20.20%**	
Age groups	1-10	95	19	3.40%	
	11-20	350	89	15.60%	0.0001
	21-30	89	7	1.20%	
	31-40	15	0	0%	
	Over 40	21	0	0%	
	Total	**570**	**115**	**20.2**	

Table 3: The prevalence of *S. haematobium* according to gender and age groups.

The macroscopical examination of urine revealed haematuria in 100 (17.6%) of the positive cases and 15 (2.6%) of them were without haematuria (Table 3). The difference in rates was found to be statistically significant at p=0.0001.

The study revealed that 45 (7.9%) the positive cases were of light and moderate intensity and 70 (12.3) the positive cases were of the heavy intensity (Table 4). The difference in rates was found to be statistically significant at p=0.0008.

	Positive%		p-value
Contact with water	Yes	107 (18.8%)	0.0001
	No	8 (1.4%)	
	Total	**115 (20.2%)**	
Hematuria	Positive	100 (17.6%)	0.0001
	Negative	15 (2.6%)	
	Total	**115 (20.2%)**	
No. of egg	1-49	45 (7.9%)	0.0008
	50 and more	70 (12.3)	
	Total	**115 (20.2%)**	

Table 4: The Correlation of *S. haematobium* infection with contact to water, hematuria, and intensity of infection.

Discussion

A prevalence rate of 20.2% for urinary schistosomiasis was reported in this study. According to the classification of the WHO expert committee on the control of schistosomiasis [16], prevalence rates greater than 25% are moderate while those below are low. Our rate was greater than the rate reported by Naeem [16] in Omshoka village in Sinnar state (5.2%) and also greater than the rate reported by Ahmed [14] in Omhani village near Kosti in the White Nile state (10.5%). It was also greater than the rate reported by Ekram [17] in Al Lamab in Khartoum state (11.1%), and greater also than rate reported by Amin et al. [18] in Khartoum state (13.2%), and by Abeer et al. [19] among school-age children in eastern Nile in Khartoum state (10.8%), and the rate reported by Sitealbanat [10] in certain village in Sharg Elnil (9.9%), and also greater than the rate reported by Ezz Alarab [20] in Dar Alsalam in Khartoum state (17.6%). Their variation may be attributed to several factors including high population density of the snail intermediate host and also to the activities practiced by inhabitants in the area as such collection of water is of vital importance.

However, the prevalence rate of this study was lower than the rate reported by Kamal [21] in Keryab village (39%), and also lowers than the rate reported by Bakhit [12] in the keryab village (25%). Their variation may be attributed to several factors including high population density of the snail intermediate host and also to the activities practiced by inhabitants in the area as such collection of water is of vital importance and swimming. From the investigation, it was obvious that the rate of infection in males (15.8%) was higher than that rate reported in females (4.4%). This finding is in line with the finding of Ekram [17] who found the prevalence to be higher in males than in females. However, our finding contradicts the finding of Bakhit [12] who reported a higher prevalence of 34% among females compared to 22% among males. Our finding might probably be due to less contact of water by females, despite the fact that our results revealed a significant correlation between infection and contact with water.

In this study, the highest prevalence rate (15.6%) was reported among the 11-20 years age group, while there was no reported positive case among the 31-40 and over 40 years age groups because may be less contact with water or may be infected and treated. This was also confirmed by Naeem [16] who reported the highest infection rate among the age group 11-20 years old.

The present study revealed that the sedimentation technique and filtration technique was similarly efficient in detecting *Schistosoma*

haematobium among the population. 115 positive cases were detected by both techniques. Mashinda et al. [22] concluded that the urine filtration technique is the standard field technique for detection of urinary schistosomiasis, but using reusable filters may give false positive finding because the filter cannot be washed adequately.

Richards et al. [23] stated that urine sedimentation by centrifugation gave higher values than filtration technique for detection of infection and intensity of urinary schistosomiasis through the number of eggs recovered in the preserved urine. The preserved urine caused obstruction of filters. The results of sedimentation obtained in the present study disagree with that obtained by Richards et al. [23] because both techniques gave same results which may be due to the fact that in this study we used fresh and unpreserved urine sample.

Conclusion

In conclusion, there is a strong relation between prevalence rate of *Schistosoma haematobium* in Abo-Mtariq area and contact with water, the infection is more prevalent in males compared to that in females, most cases of *Schistosoma haematobium* infection were confined to the 11-20 years age group and the sedimentation technique is as efficient as the filtration technique in detecting *Schistosoma haematobium* infection.

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