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Original Research Article

Prevalence and intensity of urinary schistosomiasis among selected people in Tulus area, South Darfur State, Sudan

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ABSTRACT

Background: Urinary schistosomiasis is a major public health issue in Sudan. The disease is endemic in many rural communities across the country.
Methods: This is a cross-sectional study conducted to determine the prevalence and intensity of urinary schistosomiasis among selected individual in the city of Tulus, South Darfur state, Sudan. One hundred terminal urine samples were collected and examined for *Schistosoma haematobium* eggs using standard filtration technique.
Results: A total of 100 individual were enrolled in the study with a mean (±SD) age of 17.7±0.73 years. Out of them, 62 (62%) were found to be infected with *Schistosoma haematobium*. The statistical analysis showed significant association with gender (p=0.043) with higher prevalence 70.9 % (39/55) in female than males 51.1 % (23/45). Majority of the *S. haematobium* infections were classified as intense infection (82%, 51/62) with egg count ≥50 eggs/10 ml urine, while gross haematuria was observed in 10% of urine samples.
Conclusions: In conclusion, the prevalence of *S. haematobium* infection in the study participants was remarkably high. However, further studies, including large sample size will be essential to assess the burden of the disease in the study area.

Keywords: *Schistosoma haematobium*, South Darfur state, Gross haematuria, Egg intensity, Sudan

INTRODUCTION

Urinary schistosomiasisis a chronic water-dependent parasitic disease caused by the trematode *Schistosoma haematobium* (*S. haematobium*).[1] It is the one of most devastating prevalent neglected tropical parasitic diseases (NTDs) due to the high morbidity and mortality rate among susceptible population in developing countries particularly in Africa.[2] The poor sanitation and inadequate hygiene (WASH) as well as the lack of access to clean water are major contributors to the burden of the disease.[3] In endemic tropical and subtropical countries, the disease remains as a major public health problem. The high prevalence of schistosomiasis placed it as second most important parasitic disease with public health problem after malaria.[4] In the 74 endemic countries, an estimated of 250 million people are infected while approximately 700 million people are at risk of getting the infection.[5] In Africa and Middle East *S. haematobium*is widespread with more than 110 million infectedpeople.[6] In addition, *S. haematobium*is the cause

of nearly two-thirds of schistosomiasis cases resulted in long-term and severe complications.[5] Deposition of the *S. haematobium* eggs in tissues can cause progressive damage particularly in the bladder, ureters and kidney. The potential consequences of the infection includes haematuria (blood inurine), dysuria (painful urination), nutritional deficiencies and lesions of the urinary bladder.[4] Furthermore, increasing evidence supports that the infection can lead to infertility, cancer, kidney failure and increased susceptibility to HIV. While children might experience anaemia and physical weakness which consequently reduce their learning ability.[6]

Despite the intensive efforts to control the disease, it is still persists. Many reports stated that urinary schistosomiasis is endemic in Sudan. It was first reported in the country in 1904. Since then, various epidemiological studies indicated the presence of the disease in all regions of the country.[7,8]

A recent nationwide survey carried out in all the states estimated that the overall prevalence of *S. haematobium* was 5.2%. The same survey pointed East and South Darfur States as most severe endemic areas.[9] However; there are limited data on the burden of the disease in these areas. This could be attributed to the civil war in the region as the prevention and control during conflict are often neglected. Although, in the 1970s, schistosomiasis was reported to be endemic in the western area of Darfur, there have been few detailed surveys and published data in this region, particularly during the years overwhelmed by the civil war.[9] Therefore, this study was conducted to provide preliminary information in regard to *S. haematobium* prevalence in a limited study population recruited form the city of Tulus, South Darfur state which can help in improving schistosomiasis control in the area.

METHODS

This is cross-sectional study carried out during May 2018 to estimate the prevalence of *S. haematobium* in Tulus area. South Darfur state, Sudan. The study protocol was reviewed and approved by the research committee of the institute of molecular biology, university of Nyala, and the South Darfur ministry of health, Sudan. Prior the enrolment in the study, the aims and the methodology were discussed with every participant, accordingly, a written consent was obtained before sample collection.

A total of 100 participants with different ages from both sex (45% males and 55% females) were enrolled in this Study. After informed consent was obtained, about 10 ml of urine samples were collected from each subject. The urine samples were first observed whether show occult or gross hematuria, and then examined for the presence of *S. haematobium* eggs by membrane filtration technique as described previously.[10] In brief all urine samples of sufficient quantity were shaken, subsequently, 10 ml of each sample were pressed through a polycarbonate filter with a pore size of 20 µm (Sterlitech, Kent, WA, USA) using a standard 10 ml plastic syringe, the membrane was then put on a microscope slide, covered with a piece of hydrophilic cellophane soaked in glycerol solution, and examined under the microscope by trained laboratory technicians using some drops of Lugol's iodine to stain *S. haematobium* eggs after cellophane coverage. The presence and number of *S. haematobium* eggs was recorded. After microscopy, the slides were stored for second reading for quality control.

The number of *S. Haematobium* eggs per filter was quantified; the intensity of the infection was classified as light (1-49 eggs/10 ml of urine) or heavy (≥50 eggs/10 ml of urine), as defined by the world health organization. The collected data were stored, double checked and analyzed using Statistical package for social science (SPSS) version 22.0 (Inc. Chicago, I.USA). Chi Square test was used for ordinal variables to find the significant differences between several categories and determination of the prevalence (as %), with p value of 0.05 being considered indicative of a statistically significant difference.

RESULTS

A total of 100 individuals (45 males and 55 females) were enrolled from the city of Tulus. The respondents were from the age group of 3-42 years with a mean (SD) age of 17.7 (0.73) years. The overall prevalence of *S. haematobium* among respondents was 62% (62/100). The prevalence was 51.1% (23/45) and 70.9% (39/55) for the male and female respectively. However the prevalence of the disease was high in the females than males and there was a significance difference in the prevalence rate (p=0.043), and they were not significantly more likely to have intense infections with this parasite. Majority of the *S. haematobium* infections were classified as intense infection (82%, 51/62) with egg count ≥50 eggs/10 ml urine. In addition, gross haematuria was observed in 10% of urine samples. A positive correlation between the haematuria and intensity of eggs was revealed (p=0 .000) (Table 1).

Table 1: Correlation between the haematuria and egg count.

Parameters		Haematuria	Egg count
Haematuria	Pearson correlation	1	-0.655**
	Significance (2-tailed)	-	0.000
	N	100	100
Egg count	Pearson correlation	-0.655**	1
	Significance (2-tailed)	0.000	-
	N	100	100

**Correlation is significant at the 0.01 level (2-tailed).

DISCUSSION

In Sudan, schistosomiasis remains a life-threatening public health problem with an estimation of more than eight million people at risk of infection. Thus, Sudanese government prioritised collecting data on the burden of NTDs, particularly schistosomiasis. In response; many epidemiological studies were conducted in central and east Sudan, with relatively few, if any, such studies being conducted in Darfur area.[10,11]

Therefore, this study was conducted to estimate the prevalence and intensity of *S. haematobium* infection in selected populations from the city of Tulus, South Darofur State. The study revealed that the percentage of infected people with *S. haematobium* infection based on urine filtration method was 62% (62/100). The high observed prevalence of urinary schistosomiasis (62%) was relatively in agreement with the study conducted by Deribe et al in the same state whose reported a rate of 56% of infection among the respondents.[12] Similarly, remarkably high prevalence (80.6 %) was also reported in Gereida camp, South Darfur.[13]

The high prevalence could be attributed to the high exposure and dependence of the people in the area on open water sources for drinking and household purposes.[12,14] The adaptation of intermediate host (*Bulinus truncates*) to pools and slow-flowing waters in South Darfur area reflect consideration of these water bodies to be potential transmission sites for the disease.[15] In addition, the fact that these small ponds in entire area are used for fishing, bathing and swimming increase the risk of getting the infection.

In contrast, the present study showed very much higher prevalence of *S. haematobium* compared to that obtained from Nationwide survey (5.2%), even though, South Darfur States was the second most endemic area with a prevalence of 13.91% in that survey.[9] Moreover, many other finding across the country reported lower findings when the *S. haematobium* diagnostic stages were screened particularly among children.[11,16,17] Such as that of Hajissa et al in Um-Asher area, Khartoum state; Sulieman et al in Alsaial Alsagair village, river Nile state, and Abou-Zeid et al in Southern Kordofan state.[8,18,19]

Worldwide, similar observation of high egg positive rate was also made in Senegal (57.6%) while in many other country the rates were slightly lower such as those reported from Nigeria (48%), Gabon (45%), Malawi (10.4%).[1,4,6,20] This variation could be due to study period, target population, environmental condition, sample size variations and the method of laboratory diagnosis. With regard to the intensity of the infection, majority of the *S. haematobium* infections (82%, 51/62) were of intense infection (≥50 eggs/10 ml urine). This finding agrees with previous reports where the intensity was classified as high.[1,4] However, light infection intensity was also reported.[21] The variation between areas could be explained by the frequency of people contact with contaminated water bodies, burden of the adult worms hosted as well as the differences in environmental setting and culture. As a consequence of the high prevalence with heavy *S. haematobium* infection haematuria was observed in the current study, and there was a positive correlation between the haematuria and intensity of eggs (p=0.000), this result is in line with result of Ismail et al.[16] Indeed the observed hematuria could be attributed to the heavyegg intensity reported among the study participants

Despite the slightly high prevalence of *S. haematobium* infection among the study participants. The study was limited by the small sample size. The estimated prevalence cannot reflect the burden of the disease among the whole population at the village/town level unless wide survey with large sample size is done.

CONCLUSION

The very high prevalence of *S. haematobium* infection observed in the study area, indicate that the city of Tulus is endemic for urinary schistosomiasis, with a high intensity of infection. Therefore, integrated control program and prevention measures need to be implemented in the study area.

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