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Prevalence of *Schistosoma haematobium* among Schoolchildren in New Foci in *Merowe* Locality, North State, Sudan

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Abstract: *Urinary schistosomiasis is a parasitic disease caused by blood flukes of the genus Schistosoma and acts as the second major source of morbidity and mortality in tropical and subtropical countries. The disease was reported in some cases by physicians in Merowe Locality. The study aims to determine the prevalence rates of urinary schistosomiasis among schoolchildren in Merowe Locality, Northern State, Sudan. A Cross-sectional survey was carried out from September 2019 to February 2020 in twenty basic schools in Merowe Locality. The age of schoolchildren ranged between 6 and 13 years. 1557 urine samples were collected and processed using different techniques (direct microscopy and concentration techniques). SPSS (v 21.0) was used for data analysis. The overall prevalence of urinary schistosomiasis in selected students was 1.03% with the higher infection among male students between 9 – 12 years who were active in swimming and working in the fields. Most of the pupils interviewed were found to be unaware of the disease. The findings show the need for an integrated control program against growing up urinary schistosomiasis including the treatment of all infected children and the implementation of a health education program.*

Keywords: *Schistosoma haematobium*, Urinary schistosomiasis, Prevalence, schoolchildren, Merowe, Sudan

Introduction

Human schistosomiasis is a snail borne, fresh water-transmitted neglected tropical disease. It is caused by trematodes of the genus *Schistosoma* that is widespread in Africa, the Middle East, and Latin America (1-3). The predominant feature of *Schistosoma haematobium* infection is urinary egg excretion (4), and the worm loads remain high, particularly in Sub-Saharan Africa which accounts for about 90% of people living with schistosomiasis (5). Preschool-aged, school-aged children and a few groups of individuals, like irrigation workers and fishermen, are reported to be at higher risk of urogenital and intestinal schistosomiasis infection in Africa (1).
Control of schistosomiasis is of international concern since The World Health Assembly endorsed the planet World Health Organization (WHO) NTD Roadmap in 2012 and 2013 during which NTDs were suggested as tracers of equity within the assessment of progress towards the Sustainable Development Goals and called for the control and elimination of schistosomiasis (6, 7). Afterwords in 2020, the World Health Organization (WHO) announced its new goals and vision for controlling and eliminating a number of neglected tropical diseases (NTDs) including schistosomiasis (8). WHO has set striving goals of controlling morbidity to be reached by 2020, along with removal as a public health problem in certain regions by 2025 (9). The Federal Ministry of Health (FMOH), Sudan, is framing an additional NTD strategy from control to elimination of schistosomiasis and making every effort to develop integrated interventions to disturb the transmission of schistosomiasis (1). Considering the prevalence and geographical spreading not only help in recognizing high-risk communities but also help in planning and implementation of mass drug administration supported level of infection (10, 11), and that is why the WHO recommends that young children living in endemic areas should be considered for treatment with praziquantel with the standard dose of 40 mg/kg (1). The aim of this study was conducted to estimate the prevalence rates of Urinary Schistosomiasis among schoolchildren in Merowe locality, North State, Sudan and to assist in a decision on modalities of intervention.

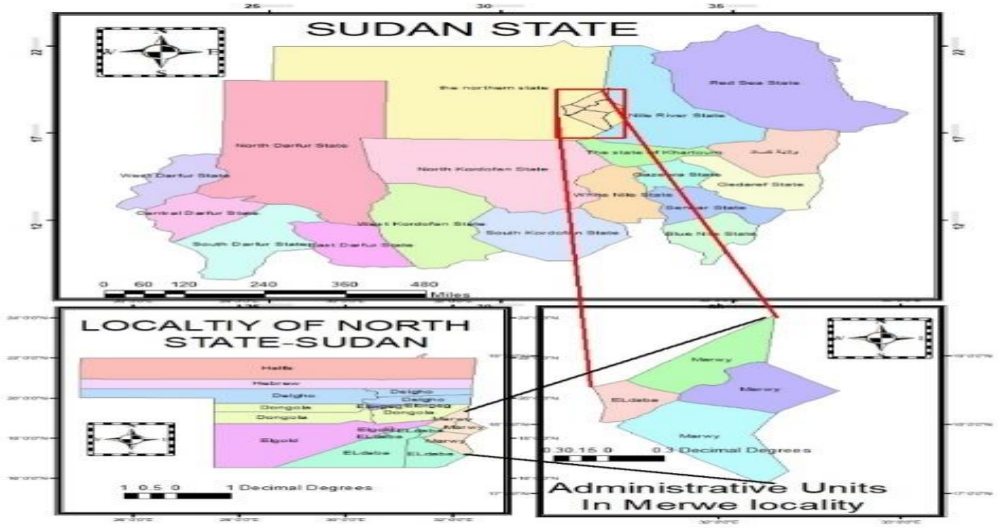
Materials and Methods

Study area:

This is study was carried out in *Merowe* Locality (16 °42′11″N and 33 °24′8″ E). All the villages were very near to the bank of the River Nile (~1 km) and the estimated population is 1485 inhabitants. All are from the same ethnic group and the majority of them earn their income from agricultural activities. The villages enjoy a good piped water supply from the River Nile or wells, and there

are health centers and basic schools; for boys and girls in each village from which the study samples were collected. In addition, there is an electricity supply for most of the houses which are built of mud-brick or red-brick. The area has an average annual temperature ranging from 10–47 °C and a mean rainfall of 29.3 mm.

Plat (1) Map of Sudan – North state – Administration Unit



Study design

A cross-sectional parasitological study was designed and conducted to assess the prevalence of urinary schistosomiasis in selected basic schools, using direct microscopy and serological rapid test (Cathodic Circulating Antigen).

Inclusion criteria

- Schoolchildren who are attending between grades 1 to 8.
- Registered children in target schools
- Newly transferred school children who are attending the target school at the time of visit.

Exclusion criteria

- Non-student.
- At the time of the visit, schoolchildren who had been transferred from their previous school.

Sample size:

At the study are student from twenty schools were enrolled according to randomized cluster sample from four administration units at risk in the Merowe locality the number of these schools was 6811 individuals and the sample size 1557 (22.9%) pupils were enrolled.

Five schools randomly were selected (14 schools) from Karima administration unit 1270 (417), Merowe administration unit five schools (10 schools) 753 (532) and Al Gorier administration unit (7 schools) 1434 (367) around 30% of students from each school, and all the five schools from Amery administration units 2354 (241), 10% from each school was included only male schools.

Ethical consideration

Ministry of Health in Merowe Locality, Northern State was provided an approval for this study. The study was received further approval from the District Education Officer, Prior to the study, the research team conducted meetings with the village executive officers, teachers, and students of selected villages and schools, respectively. During these meetings, the objectives of the study, the study procedures, sampling, and potential risks and discomforts were explained.

Sample collection

The students were advised to collect only terminal urine samples, and return immediately. The collection of samples was carried out between 10 Am and 2 Pm since this is a period during which eggs of S. haematobium are more likely to be passed in urine and processed, adhering to standard protocols. Instructions were given to the student to conduct physical exercise prior to urine collection to improve egg-detection putting in consideration that the exercise before collecting the sample is controversial effect on the result (12).

Laboratory analysis:

For each urine sample the following procedure was done:

1. Physical examination for, aspect and color to detect visible hematuria (macro-hematuria) (13).
2. Detection of micro-hematuria (blood) by chemical reagent strips test (Urorocolor, 9SD, Standard Diagnostics, Korea) (14).

3. Circulating Cathodic Antigen (CCA) was done for 10% of the sample and moreover all positive cases by direct microscope also tested because it was suggested that reagent strips alone are not sufficient for rapid investigations, instead two-step line is thus recommended in case of hematuria positive urine samples are subsequently examined using serology and microscopy (15).
4. The detection of *S. haematobium* eggs by microscopic examination was done using the centrifugation sedimentation technique (1, 16).
5. Counting of *S. haematobium* eggs microscopically was done using the Swinnex filtration technique.

Data Analysis

The data were collected, revised, coded, and fed to statistical software SPSS version 21(Chicago, IL, USA) for Windows.

Results

Total of 1557 (22.9%) students were screened out of 6811 students from the four administration units at risk in Merowe Locality around 30% by direct microscope. The overall prevalence is 16 (1.03%) students for *S. haematobium*. All the positive student by direct microscopy and 10% random sample (108) students tested by Circulating Cathodic Antigen (CCA) were negative.

The prevalence in each administration units

In *Merowe* administration unit (30.3 %) were selected for microscopy, randomly five school was selected (~ 30%) from each table (1).

Table 1: Prevalence of infection in Merowe administration unit**.**

No	School name	Students No	Samples	Positive	Percent
1	**New Merowe**	303	94	1	1.06%
2	**AlHamadab East**	375	118	0	0.00%
3	**Balalh**	300	103	0	0.00%
4	**AlHugab**	400	109	0	0.00%
5	**Abu Doum**	375	108	0	0.00%
Total		1753	532	1	1.06%

In *Karima* administration unit (32.8%) were selected for direct microscopy, randomly five school was selected (~ 30%) from each table (2).

Table 2: Prevalence of infection in Karima administration unit.

No	School name	Students No	Samples	Positive	Percent
1	**AlRajhei**	335	103	0	0.00%
2	**Mabrook**	230	77	1	1.30%
3	**AlKhatime**	250	87	0	0.00%
4	**AlSwigat**	180	60	2	3.33%
5	**AlKooe**	275	90	0	0.00%
Total		1270	417	3	4.63 %

In *AlGorier* administration unit (25.6 %) were selected for microscopy, randomly five school was selected (~ 30%) from each table (3).

Table 3: Prevalence of infection in Al Gorier administration unit.

No	School name	Students No	Samples	Positive	Percent
1	**Umshdirh**	300	70	2	2.86%
2	**New Al Gorier**	296	90	2	2.22%
3	**Osley East**	392	67	0	0.00%
4	**AlGuribh**	90	30	1	3.33%
5	**Ambkool**	356	110	0	0.00%
Total		1434	367	5	8.41%

In *Amery* administration unit (10.2%) were selected for microscopy, all the five schools was enrolled (~ 10%) table (4).

Table 4: Prevalence of infection in Amery administration unit.

No	School name	Students No	Samples	Positive	Percent%
1	**Alsdeag (village2)**	405	40	0	0.00%
2	**Alfaroug (village 3)**	539	54	2	3.70%
3	**Alwelide (village 3)**	437	48	2	4.17%
4	**Musab (village 4)**	529	54	1	1.85%
5	**Ammar (village 5)**	444	45	2	4.44%
Total		2,354	241	7	14.17%

The overall prevalence of infection in all administration units in *Merowe* Locality was 1.03% for *S. haematobium*.

Discussion:

According to the findings of this study, the prevalence of *S. haematobium* in schoolchildren in *Merowe* Locality, Northern State, Sudan was 1.03%. To the best of our knowledge, this is the first study to identify the prevalence of *S. haematobium* in the area; because it is new foci, it can therefore serve as a baseline for studies for integrated control for schistosomiasis.
In the *Merowe* administration unit, only one case positive and my acquired from any area else and water canal except one canal near to Abu Doum. In *Karima* administration showed three cases because of two water canals one in AlBarkle scheme (which reported many cases by pediatrics) and the other from AlKasenger scheme.
The prevalence in the *AlGorier* administration unit was (8.41%) which is high due to many water canals in the area near to the village and some crossing the village. The *Amery* administration unit has more prevalence (14.17%) and that my due too many water canal and closed to the village less than one kilometer.
Merowe Locality free zone of schistosomiasis expect sporadic case after Nile rivers flood, so all the inhibitors have no awareness about the diseases and it is transmission and the disease-induced after the Merowe Dams, steel many areas according to our results not reported any positive case.
All positive cases are *S. haematobium* in the area by direct microscopy and the serological test Cathodic Surface Antigen showed negative and have no role in the diagnosis of *S. haematobium*.

Conclusion

The findings of this study indicate that the prevalence of urinary schistosomiasis in the *Merowe* Locality was 1.03%. Our results suggest the association of any irrigated scheme with the prevalence of urinary schistosomiasis in developing countries. The bad sanitation and lack of healthy drinking water were the major causes of infection. We recommended any new irrigated Scheme might be far from population especially schoolchildren.

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Conflict of interest

The author declares no conflict of interest.

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