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Prevalence of Intestinal Schistosomiasis among Basic School Children in White Nile Sugar Scheme a New Irrigated Project, White Nile State, Sudan

Abdelhakam G Tamomh, Sabah R Yousfi, Adam D Abakar and Bakri YM Nour*

Department of Parasitology, Faculty of Medical Laboratories Sciences, University of Gezira, Sudan

***Corresponding author:** Bakri YM Nour, BSc, MSc, PhD, Professor of Medical Parasitology, Department of Parasitology, Faculty of Medical Laboratories Sciences, University of Gezira, Sudan, Tel: +249923579150; E-mail: bakrinour@gmail.com

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Abstract

Intestinal Schistosomiasis is one of the most public health problems caused by blood-dwelling flukes in the world especially where irrigated Schemes established with bad sanitation. The objective is to determine the prevalence of intestinal schistosomiasis among school children in White Nile State-El Qeteena Locality, Sudan. A school-based descriptive study design was conducted among basic school children at White Nile sugar scheme, El Qeteena locality during the period December 2014 to April 2015. A standardized administered questionnaire was developed, then pre-tested and used for data collection and stool examination was done for a total of 480 school children were selected. The collected data through the questionnaire and the checklist were analyzed using the SPSS. The overall prevalence of intestinal schistosomiasis was 25.6%. The highest prevalence of *S. mansoni* was reported in the age group (9-12) years 47.2% followed by the group over 12 years (31.7%). The overall prevalence of (15.4%) for female and (84.6%) for the male. Inadequate numbers of latrines with bad sanitation were the main risk factors associated with the disease transmission. On the basis of the results and according to the statistical analysis there was a relation between environmental sanitation and the prevalence of infection. The intestinal schistosomiasis infection is important health problem among school children and further control program must be done in the area of the study.

Keywords: Prevalence; Intestinal schistosomiasis; *S. mansoni*

Introduction

Intestinal schistosomiasis is a chronic debilitating disease in many tropical and subtropical countries caused by blood-dwelling flukes of the genus *Schistosoma* [1]. After Malaria it is the most important parasitic disease in terms of prevalence, morbidity and mortality rates [2]. Schistosomiasis is considered as a neglected tropical disease (NTD) [3,4]. Some authors attributed such neglect to the long-standing underestimation of its harmful scale owing to the asymptomatic nature of most cases [5]. The elimination of Schistosomiasis, besides other NTDs, is now recognized as a priority for achieving the Millennium Developmental Goals (MDGs) and targets declared by the United Nations for sustainable poverty reduction in the affected areas of the tropics and subtropics [6]. The majority of Schistosomiasis cases are prevalent among poor people in sub-Saharan Africa who lack access to health services, safe water, sanitation, and education. Furthermore, the disease helps keep them poor by lessening their ability to work, learn, and contribute to their communities [7]. In spite of the implementation of control programs, the global distribution of infection has changed over the last half of the twentieth century, but the number of infected people has not reduced [8]. Schistosomiasis continues to infect millions in poor communities in developing countries despite the effectiveness and cheapness of Praziquantel [6]. School-age children are the primary target of the study because are at highest risk of infection to recent exposure to infection and consequently the early stage of their chronic lesions, also early diagnosis and treatment during childhood, therefore, prevents chronic morbidity in later years [9]. Control of schistosomiasis is of international concern, and the aim is to reduce morbidity within the definitive host [10]. So, burdens and complications of intestinal schistosomiasis a study addressing detection and identification of the disease, health education, and snail control, is justifiable and highly needed, pairing in mind there was no previous study in intestinal Schistosomiasis in the study area. Schistosomiasis has been recognized since the time of the Egyptian pharaohs. The worms were eventually discovered in 1851 in Kasr El-Aini Hospital, Cairo, Egypt, by Theodor Bilharz [11]. *S. japonicum* eggs had been identified in mummified bodies from ancient China [12]. In Japan, a disease known as Katayama disease, which affects people, cattle, and horses through abdominal swelling, wasting and rashes on the legs, was first described by Daijiro Fujii in 1847 [13]. General consensus about the life-cycle, the various species, and their intermediate hosts was not reached until 1913 after convincing experiments by the Japanese researchers Keinosuke Miyairi and Masatsuga Suzuki (on *S. japonicum*) and the British researcher Robert Leiper in 1915 (on *S. haematobium*) had outlined the history of the diagnostic method of identifying eggs in faeces [12,14].

Materials and Methods

The White Nile Sugar Scheme is located at Al Kawwa administrative unit which is one of *EL Qeteena* locality- White Nile state, Sudan. Its boundaries are White Nile in the West, Al Gezira state in the East, Al Kawwa town in the south and Wad Elzzaki and El Qeteena town in the North. White Nile Sugar Scheme campus is divided into three parts according to Khartoum highway road AL Gezira state. The West part includes Mabroka village. The middle part includes Al-Hidaib and Abu-Halageem villages the North part include Al Hetaira and Al Ahamda villages. It is a savannah region which is very hot in summer and dries cool in winter. The mean annual rainfall is about 70 mm, mean annual humidity is 29% and mean temperature is 30°C. The sources of water supply are canals derived from the White Nile in all

parts of the scheme started and donkey cart. There are six basic schools, one for boys and the other five are shared between the two sexes. A cross-sectional descriptive study was conducted to determine the prevalence of Intestinal Schistosomiasis among basic school children at White Nile Sugar Scheme campus, El-Qeteena locality, White Nile State, Sudan, 2015. The study was carried out in six basic school children at White Nile Sugar Scheme campus and the pupils were selected randomly, 95 from Abu-Halageem school, 80 from Al-Hidaib school, 90 from Mabroka school, 81 from El-Shaheed Adam Hassan school, 86 from Al-Hefaira school and 48 from Al-Ahamda school.

Inclusion criteria

- School children who are attending grades 1, 2, 3, 4, 5,6,7,8.
- Registered school children in the targeted schools.
- Newly transferred schoolchildren who are regularly attending the targeted schools at the time of the visit.

Exclusion criteria

- Non student,
- School children who were transferred from the school at the time of the visit.

At the study area (six basic schools) were selected according to the burden of schistosomiasis in White Nile state, the number of pupils in these schools was 1696 individuals, and the sample size (382) pupils were determined using the formula.

$n=z^2. Pq/d^2$ [15]

Where:

n=Sample Size

z=the value of the standard normal variable corresponding to is 95% level of significance (1.96)

p=Expected prevalence (46%)

q=1–P (0.54)

d=marginal error (0.05)

$n=(1.96)^2.(0.46)(0.54)/(0.05)^2=381.6$

The pupils then completed to 480 pupils Four hundred and eighty stool samples and collected randomly from selected students. Information was collected regarding the individual number, age, and sex. Also, the information includes toilet, father occupation, contact to water, sources of drinking water, and blood in the stool. The questionnaire was constructed and explained to the students in simple Arabic. Before samples were collected, students were advised on health hygiene and were given instruction on how to take the samples and the amount of stool needed. Students also instructed not to contaminate stool with urine and water. About 50 gm of stool was collected from each patient in clean dry wide mouth plastic with screw cap stool container. Each container was labeled clearly with patient number and name, preserved in 10% formol saline, and then immediately transferred to the laboratory for examined using direct stool examination technique and formol-ether concentration technique. The detection of *S. mansoni* egg or intestinal *Schistosoma* eggs in stool sample was conducted according to the method as flows [16]: Firstly a drop of fresh physiological saline was placed on slide using a piece of stick, a small amount of specimen (about 2 mg), was mixed to make smooth thin preparation, then covered with cover glass and examined microscopically using 10x and 40x objectives. Formol-ether concentration technique was used and about one gram of feces placed in a container; 4-7 ml of 10% formol saline added, then emulsified and sieved using a fine sieve. The sieved sample was transferred to 15 ml centrifuge tube, about two ml of diethyl ether added, shaken gently for few seconds, centrifuged, the fecal debris released from the surface of the tube then the supernatant discarded. The sediment mixed by means of Pasteur pipette and transferred to a microscopic slide, covered with cover glass and examined microscopically using 10x and 40x objectives. The number of eggs is calculated and recorded as a number of eggs per gram of feces [16]. After data were collected it was revised, coded and fed to statistical software SPSS version 21.

Results

Out of 480 stool samples were collected and screened for *S. mansoni* using direct stool examination and formol-ether concentration technique. The numbers of infected cases for *S. mansoni* in stool samples were 95 (19.8%) using direct examination techniques and 123(25.6%) using culture technique (Table 1).

Techniques\Cases	Direct stool examination	Formol ether concentration
Infected cases	95 (19.8%)	123 (25.6%)
Non infected cases	385 (80.2%)	357 (74.4%)
Total	480 (100%)	480 (100%)

Table 1: The number and percentage of infected and non-infected cases with *S. mansoni* using direct method and formol-ether concentration technique.

Prevalence of infection according to age group

The age of patients was grouped into three groups; age group one, age group two and age group three which represent the age of 5-8, 9-12, over 12 years respectively (Table 2).

Techniques\Age groups	Direct stool examination	Formol ether concentration
5-8 years	23 (24.2%)	26 (21.1%)
9-12 years	58 (61.1%)	58 (47.2%)
Over 12 years	14 (14.7%)	39 (31.7%)
Total	95 (100%)	123 (100%)

Table 2: The number and percentage of infected cases with *S. mansoni* using direct method and formol ether concentration technique correlated with age group.

Prevalence of infection according to sex

Out of one 480 samples examined, 382 (79.6%) were males and 98 (20.4%) were females (Table 3).

Prevalence of infection according to present or absent of latrine

Out of 480 stool samples investigated 139 (29%) have latrines and while 341 (71%) without latrines (Table 4).

Prevalence of infection according to sources of drinking water

Out of 480 stool samples examined from students drinking from pipe were 100 (20.8%), from canals were 260 (54.2%) and from donkey cart were 120 (25%) (Table 5).

Techniques\Sex	Direct stool examination	Formol ether concentration
Male	76 (80%)	104 (84.6%)
Female	19 (20%)	19 (15.4%)
Total	95(100%)	123 (100%)

Table 3: The number and percentage of infected cases with *S. mansoni* in relation to sex using direct method and formol ether concentration technique.

Techniques\Cases	Direct stool examination	Formol ether concentration
Present	22 (23.2%)	30 (24.4%)
Absent	73 (76.8%)	93 (75.6%)
Total	95 (100%)	123 (100%)

Table 4: The number and percentage of infected cases with *S. mansoni* according to the latrine facility using direct method and formol ether concentration technique.

Techniques\Cases	Direct stool examination	Formol ether concentration
Pipe	35 (36.8%)	35 (28.5%)
Canal	47 (49.5%)	59 (47.9%)
Donkey cart	13 (13.7%)	29(23.6%)
Total	95 (100%)	123(100%)

Table 5: The number and percentage of infected cases with *S. mansoni* in according to sources of drinking water using direct method and formol ether concentration technique.

Prevalence of infection according to family occupation

Out of 480 stool samples examined families of students farmer were 150 (31.3%), employee were 80 (16.7%), laborers were 190 (39.6%) and others 60 (12.5%) (Table 6).

Cases	Direct stool examination	Formol ether concentration
Farmer	58 (61%)	58 (47.2%)
Employee	10 (10.5%)	23 (18.7%)
Laborer	14 (14.7%)	26 (21.1%)
Others	13 (13.7%)	16 (13%)
Total	95 (100%)	123 (100%)

Table 6: The number and percentage of infected cases with *S. mansoni* in according to family occupation using direct method and formol ether concentration technique.

Prevalence of infection according to contact or not contact to water

Out of 480 stool samples investigated 350 (72.9%) are contact and while 130 (27.1%) without contact to water (Table 7).

Techniques\Cases	Direct stool examination	Formol ether concentration
Contact	77 (81%)	101 (82.1%)
Not contact	18 (19%)	22 (17.9%)
Total	95 (100%)	123 (100%)

Table 7: The number and percentage of infected cases with *S. mansoni* according to the contact or not contact to water using direct method and formol ether concentration technique.

Prevalence of infection according to schools

Out of 480 stool samples investigated 95 (19.8%) are in Abu-Halageem, 80 (16.7%) in Al-Hidaib school, 90 (18.8%) in Mabroka school, 81 (16.9%) in Al-Shaheed Adam Hassan, 86 (17.9%) al-Hefaira and 48 (10%) are in Al-Ahamda basic school (Table 8).

Techniques\Cases	Direct stool examination	Formol ether concentration
Abu-Halageem	24 (25.3%)	24 (19.5%)
Al-Hidaib	20 (21%)	20 (16.3%)
Mabroka	20 (21%)	20 (16.3%)
Al-Shaheed Adam Hassan	3 (3.2%)	16 (13%)
Al-Hefaira	17 (17.9%)	20 (16.3%)
Al-Ahamda	11 (11.6%)	23 (18.6%)
Total	95 (100%)	123 (100%)

Table 8: The number and percentage of infected cases with *S. mansoni* according to the schools using direct method and formol ether concentration technique.

Discussion and Conclusion

This study was conducted in White Nile Sugar Scheme campus in *El-Qeteena* locality White Nile State among basic school children to determine the prevalence of Intestinal Schistosomiasis, and to assess the environmental and socioeconomic factor influencing the spread of the disease during the period from December 2014-April 2015. The study recorded the prevalence of (25.6%) for intestinal Schistosomiasis. The prevalence was high among males (84.6%) for males and (15.4%) for females for intestinal Schistosomiasis. This is in accordance with the results obtained by Suliman RF [17] who found a prevalence of 57.8% for males, and 42.2% for females for *S. mansoni* in Gezira Scheme. The study showed high prevalence of intestinal Schistosomiasis among age group (9-12) years which reach up to 47.2%. This result agreed with those of who found prevalences of 55.2%, 40.7% and 57.5%, respectively for both species in the same age groups [18-20]. The study investigated the prevalence of intestinal Schistosomiasis in relation to latrine facilities. The infection was high among those who have no latrine facilities (75.6%) for intestinal

Schistosomiasis. This result agree with Hilali [20] and El-Katsha et al. [21] who found that the transmission of the disease was related to intensive contamination of water bodies with human organic matter waste, bad sanitation of water bodies, such as requirement of ablution, like washing the anals or urethral orifices after urination and defecation. Many other factors were found to contribute to the transmission of the disease among them were a family occupation and sources of drinking water and the poor people are more susceptible to disease. Sex and age parameters, which show differences in transmission, school children are more infected than others. The prevalence of intestinal Schistosomiasis according to the source of drinking water was found to be high among those who drink from canals, (28.5%) from those who have healthy water for intestinal Schistosomiasis. According to water contact, the study showed a high prevalence of (82.1%) for intestinal Schistosomiasis among those with frequent contact to water. This could be explained by the fact that contact to water is the main cause of infection as it is evident from this study which revealed a high prevalence of urinary and intestinal Schistosomiasis in relation to occupation. The prevalence among the farmer was (47.2%) for intestinal Schistosomiasis because they work in culturing and irrigation of sugar cane which subject them to repeated exposure during working. Comparing the prevalence of urinary and intestinal Schistosomiasis between different schools at White Nile Sugar Scheme campus, the highest prevalence was found in Abu-Halageem basic school for boys and girls which reach up to (19.5%) for intestinal Schistosomiasis, this may be due to the fact that the school was surrounded by sub-major and minor canals from all directions in addition to that the canals are the only source of drinking water available beside the absence of latrines which result in continuous contamination of canals that increase the disease transmission. The intensity of the infection obtained during this study was 50 eggs/10 ml of urine for urinary Schistosomiasis. This low-intensity level may attribute to mass treatment intervention by Schistosomiasis control program.

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