Prevalence of Schistosomiasis among School Children-South Kordofan State

Mustafa Khidir Mustafa Elnimeiri and Ahmed Bolad

Faculty of Medicine and Health Sciences-Alneelain University-Khartoum –Sudan

Corresponding author: Dr. Mustafa Khidir Mustafa Elnimeiri nimeirimust@gmail.com

Abstract

Background: Schistosomiasis is endemic in Sudan and cases can be detected in all states except the Red Sea State. It a behavioral disease which always occurs where sanitary standards are low and man is the final sole host. Schoolchildren who live in such endemic areas are at risk of Schistosomiasis as they tend to swim and bath in water channels and get exposed to the infective cercariae.

The objective: The overall objective of the study was to estimate the prevalence rates of Schistosomiasis and important parasitic infections among schoolchildren in South Kordofan State.

Materials and methods: A school-based descriptive study design was used. The study was conducted in 40 basic schools in South Kordofan State namely: Tablodi and Eldalanj Localities. A standardized administered questionnaire was developed, pre-tested and used for data collection. Standard laboratory techniques were used for conduct of the required urine and stool investigations. 592 schoolchild were included in the sample. The collected data through the questionnaire and the checklist were analyzed using the SPSS.

Results: 24% of the sampled schoolchildren had an attack of diarrhea in last two weeks prior to the date of the visit while 12% of the sampled schoolchildren stated that they were currently having blood in urine. However in 6% (60 per 1000) of the sampled schoolchildren, the urine specimens showed ova of S. haematobium on conduct of microscopic examination. 13% of the sampled schoolchildren stated that they were currently having blood in the stool. None of the
stool specimens showed S. mansoni on conduct of microscopic examination. The prevalence rate of entrobiasis among the sampled schoolchildren is 20 per1000 which is highest prevalence compared to other parasitic infestations. The mean HB% estimates of the sampled schoolchildren for all grades were less than 70%.

**Conclusion:** The school children in South Kordofan were largely affected by urinary Schistosomiasis and other parasitic infections and diarrhea which all lead to iron deficiency and anaemia.

**Recommendations:** It is advised to implement effective diarrhea control strategies to reduce the prevalence among the schoolchildren. It is necessary to develop an appropriate interventional programs for control of urinary Schistosomiasis targeting schoolchildren in South Kordofan State. Case detection and management of parasitic infections among the schoolchildren is necessary to de-worm the school children

**INTRODUCTION**

Schistosomiasis is a chronic, parasitic disease caused by blood flukes (trematode worms) of the genus *Schistosoma*. More than 207 million people are infected worldwide, with an estimated 700 million people at risk in 74 endemic countries. Hygiene and play habits make children especially vulnerable to infection, and in many areas a large proportion of school-age children are infected (1).

It is thought Schistosomiasis has affected the people of Sudan for many centuries. Its spread could have been associated with the traders who frequented the Nile Valley in ancient times. In the eighth and seventh centuries B.C., southern Egypt and northern Sudan formed a single political entity. In 1918, Christopherson suggested that Schistosomiasis is endemic in all provinces, with the exception of the desert fringing the Red Sea (2).

Schistosomiasis is endemic in Sudan and cases can be detected in all states except the Red Sea State. It a behavioral disease which always occurs where sanitary standards are low and man is the final sole host. Schoolchildren who live in such endemic areas are at risk of Schistosomiasis as they tend to swim and bath in water channels and get exposed to the infective cercariae.
The endemicity of Schistosomiasis presents a dual picture. Many control programs have been, and continue to be successful, in reducing mortality, morbidity and transmission, to the extent that it is now possible to contemplate elimination of the disease. However, Schistosomiasis remains a major cause of mortality and morbidity in a number of countries, notably those of sub-Saharan Africa (3).

The study is expected to estimate prevalence rate of Schistosomiasis among school children which can be used for formulation of intervention programs. In addition such information can help in monitoring and evaluation of the progress of the interventional programs at the school level. The yielded prevalence rate can reflect the overall situation of the disease at the community level. The aims of the current study is to estimate the prevalence of Schistosomiasis and other important parasitic infestation among the schoolchildren aiming to avail information for appropriate control intervention.

PATIENTS AND METHODS

**Ethical considerations:** A letter of national endorsement was obtained from the Federal Directorate of Research-Federal Ministry of Health (FMOH). Then a letter of acceptance was obtained from South Kordofan State Ministry of Health (SKSMOH) and South Kordofan State Ministry of Education (SKSMOE). At the level of the school, the acceptance of the school head teachers and the parents’ councils was obtained after thorough explanation of the objectives and methods of the survey. For each of the sampled schoolchild, verbal proxy consent was obtained before interviewing. The results of the laboratory investigations were made available for the schoolchildren and their parents or guardians in case of orphans.

All the collected information was saved in a special computer with a password accessed only by the principle investigator. All the biological specimens were destroyed immediately after conduct of the appropriate investigation and no specimen were transferred outside the state or the country or used for any other purposes.

**Study design:** School-based descriptive survey.
Study area: The study was conducted in 40 basic schools in South Kordofan State namely: Tablodi and Eldalanj Localities.

Study population.
The study population was composed of school children of 40 basic schools in Talodi and Eldalanj Localities. The total number of the schoolchildren in the two localities was estimated to be about 17,253. The age of the basic schoolchildren ranged from 6-13 years.

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

Exclusion criteria:
- Schoolchildren who were transferred from the school at the time of the visit.

Data collection method:
A standardized administered questionnaire was developed, pre-tested and used for data collection

Laboratory investigations: Standard laboratory techniques were used for conduct of the required investigations.

Urine for S. haematobium ova
Coded containers were used to collect urine specimens from the sampled schoolchildren. The collected specimens were examined by the laboratory technicians on the same day in a neighboring health facility. The urine specimen was examined using the syringe method. The laboratory results were documented in the designed chapter in the questionnaire by the field supervisor.

Stool for S. mansoni ova
Coded containers were used to collect specimens from the sampled schoolchildren. The collected specimens were examined by the laboratory technicians on the same day in a neighboring health facility. The stool specimen was examined using the Kato-Katz method:

- In addition the stool specimen was examined by the laboratory technicians for the presence of other parasitic ova.
- Estimation of the HB%: a specimen of 2 ml of blood was obtained by finger prick and using the hemocue photometer, the laboratory technicians estimated the HB level. The result was documented by the field supervisor in the designed chapter in the questionnaire.

**Sample size:**
The following formula was used for estimation of the sample size:

\[ n = \frac{Z^2 \times P \times Q}{d^2} \]

Where:
- \( Z \) = the normal standard deviate (\( z = 1.96 \)).
- \( P \) = the frequency of occurrence of an event: For the purpose of this study, the prevalence rate of urinary Schistosomiasis among schoolchildren was the most important variable to be estimated in the survey. As there were no previous surveys among the schoolchildren, it was assumed that the prevalence rate of urinary Schistosomiasis is 50%. Thus \( P \) is 0.5.
- \( Q \) = 1 - \( P \) (the frequency of non occurrence of an event):\( d \) = degree of precision (0.04%)

Applying the above formula, then the estimated sample size for this survey was:

\[ 1.96^2 \times 0.5 \times 0.5 / 0.04^2 = 600 \]

Actually due to the constraints in the field such as closing of the schools, in one locality, the authorized persons refused the conduct of the survey and beginning of the rainy season, only 592 schoolchild were included in the sample.
The sampling technique:
The following sampling technique was used to draw the sampled schoolchildren:

1. The total number of the schoolchildren per each locality was obtained.

2. Then the number of the schoolchildren to be selected from each locality was obtained by dividing the total number of the schoolchildren per locality by the total number of the schoolchildren and then multiplied by the sample size (proportional to size).

3. To obtain the total number of the selected schoolchildren from each school, the total number of schoolchildren per school was divided by the total number of the schoolchildren per locality multiplied by the sample size of the locality (as obtained in step 2). Again this was proportional to size to render the sample representative, as more students were drawn from schools with greater numbers of pupils and vice versa.

4. Then to determine the number of students to be obtained from each class, then the stratified random sampling technique was used by dividing the total number of the students per class by the total number of the students up to the 8th grade and then multiplied by the sample size for the school.

5. To select the students to be included from the class, then the systematic random sampling technique was used. This could be obtained firstly by dividing the total number of the pupils per class by the sample size to determine the sample interval (K). Then the list of the class was used to blindly select the first number of the pupil to be selected and then the desired number of the pupils was obtained systematically by adding (K) to the first number.

Plan of data analysis

The collected data through the questionnaire and the checklist were analyzed using the SPSS.
RESULTS

Table 1:- Distribution of the schoolchildren by gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>290</td>
<td>49</td>
</tr>
<tr>
<td>Female</td>
<td>302</td>
<td>51</td>
</tr>
<tr>
<td>Total</td>
<td>592</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 1:- Prevalence of diarrhea among the schoolchildren

24% of the sampled schoolchildren had an attack of diarrhea in last two weeks prior to the date of the visit.
12% of the sampled schoolchildren stated that they were currently having blood in urine. However in 6% of the sampled schoolchildren, the urine specimens showed ova of S. haematobium on conduct of microscopic examination (as shown in figure 3).

Figure 3:- Presence of ova of Schistosoma haematobium in urine
Figure 4-: Currently having blood in stool

13% of the sampled schoolchildren stated that they were currently having blood in the stool. None of the stool specimens showed S. mansoni on conduct of microscopic examination.

Table 2-: Prevalence rates of parasitic infestation among the sampled schoolchildren:

<table>
<thead>
<tr>
<th>Parasitic infestation</th>
<th>Prevalence rate : per 1000 schoolchildren</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascariasis</td>
<td>3/1000</td>
</tr>
<tr>
<td>Ankylostomiasis</td>
<td>7/1000</td>
</tr>
<tr>
<td>Trichuriasis</td>
<td>12/1000</td>
</tr>
<tr>
<td>Entrobiasis</td>
<td>20/1000</td>
</tr>
</tbody>
</table>

The prevalence rate of entrobiasis among the sampled schoolchildren is 20 per1000 which is highest prevalence compared to other parasitic infestations.
The study reveals high prevalence of diarrhea among the sampled schoolchildren (24%). Such high prevalence of diarrhea is expected with the poor environmental conditions both at the community and school level. This is directly related to the safety and cleanliness of the water supplies for the schools and homes.

Twelve percent of the sampled schoolchildren stated that they were currently having blood in urine. However in 6% of the sampled schoolchildren, the urine specimens showed ova of S. haematobium on conduct of microscopic examination. The result is expected as urinary Schistosomiasis is known to be endemic in South Kordofan State and the schoolchildren are always at high risk to be infected. The difference between the two results can be attributed to the fact that about 3% of the sampled schoolchildren did not provide their urine specimens for laboratory examination and thus their infection status remained unknown. Another possible

Figure 5-: Mean Hb% estimates of the sampled schoolchildren

The mean Hb% estimates of the sampled schoolchildren for all grades were less than 70%.

DISCUSSION
reason for this difference might be related to recent administration of anti-schistosomal treatment which made it difficult to demonstrate the S. ova in urine specimens. However the prevalence rate of urinary Schistosomiasis among the schoolchildren is expected to be around 60 per 1000. The result is lower in comparison to the prevalence among school children in Minna, Nigeria with overall prevalence of urinary Schistosomiasis, as confirmed by the presence of egg of Schistosoma haematobium was 12.9% (4). The study result is even lower in comparison to the study conducted by Salah Adam Abdalla and Yong-Hua Hu in in El Gorashi Sector, Gazeira State among school children where he results showed that the prevalence of schistosoma haematobium for the search schools was 28.5% in Al Fakhaheer, 38.6% in Ahmed El Mostafa (5). Marked difference between the two results is due to the fact that Schistosomiasis is highly endemic in Gazeira State the South Kordofan State.

About 13% of the sampled schoolchildren state that they are currently having blood in their stools. However none of the specimens show ova of S. manoni. This might indicate the low prevalence of S. mansoni among the schoolchildren in South Kordofan State. However other causes of blood in the stool such as E. histolytica might be responsible for such condition.

Although the HB% estimate is a rough technique but such findings were indicative of widely prevailing nutritional anaemias among the sampled schoolchildren. Since hookworm disease, trichuriasis and Schistosomiasis all cause blood loss and lead to iron deficiency and anaemia, it is reasonable to conclude that the educational performance of infected school children will be impaired unless a program of regular deworming is introduced to keep infection intensities low (2). However, It may be necessary to conduct proper nutritional survey to analyze the underlying determinants.

CONCLUSION
The school children in South Kordofan were largely affected by urinary Schistosomiasis and other parasitic infections and diarrhea which all lead to iron deficiency and anaemia.

RECOMMENDATIONS
- It is advised to implement effective diarrhea control strategies to reduce the prevalence among the schoolchildren. The control strategies include awareness-raising among
schoolchildren, personal hygiene, and supply of safe water supply, early case detection and management with extensive use of oral rehydration salt.

- It is necessary to develop an appropriate interventional programs for control of urinary Schistosomiasis targeting schoolchildren in South Kordofan State.
- Case detection and management of helmenthic infections among the schoolchildren with emphasis on entrobiasis, ascariasis and trichuriasis
- Special nutritional survey need to be conducted in order to assess the nutritional disorders including nutritional anemia and underweight among the schoolchildren.

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REFERENCES