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## Prevalence of Intestinal Parasites among Selected Group of Primary School Children in Alhag Yousif Area, Khartoum, Sudan

Hussein Sharif Siddig<sup>1</sup>, Imad Abdelgalil Mohammed<sup>1</sup>, Mosab Nouraldein Mohammed<sup>2\*</sup> and Ahmed Mustafa Bashir<sup>3</sup>

<sup>1</sup>Department of Microbiology and Medical Parasitology, Faculty of Medical Laboratory Sciences, National Ribat University, Sudan

<sup>2</sup>Medical Parasitology Department, Elrazi University, Sudan

<sup>3</sup>Soba University Hospital, Sudan

\*Corresponding e-mail: [musab.noor13@gmail.com](mailto:musab.noor13@gmail.com)

### ABSTRACT

*Intestinal parasites constitute major health problems, especially in the tropical and subtropical regions. In developing countries, it is estimated that 3.5 billion people are affected and 450 million are ill as a result of these infections, the majority of them being children. This was a cross-sectional school based study. It was conducted in the primary schools of Alhag Yousif, East in East Nile locality, Khartoum State and aimed to estimate the distribution of intestinal parasites among the school children in the study area. 120 stool samples were collected and analysed by direct saline stool preparation and Formol-Ether Concentration Technique. Results shows that, (84%) stool samples were positive by the Formol-Ether Concentration technique. While (65%) were positive by the direct saline stool preparation. Intestinal parasites were more prevalent among the male students (80%) than the females (60%). Furthermore, they were more prevalent among the age group 5 to 7 years old (5%). The study concludes that intestinal parasites were more prevalent among the male students and among the age group 5 to 7 years old. The study recommends using Formol-Ether Concentration technique for diagnosis of intestinal parasites.*

**Keywords:** Intestinal parasites, Sudan, Children, Formol-ether concentration technique

### INTRODUCTION

Intestinal parasitic infections are amongst the most common infections throughout the world. It is estimated that some 3.5 billion people are affected, and that 450 million are ill as a result of these infections, the majority being children [1]. These infections are regarded as a serious public health problem, as they can cause iron deficiency anaemia, growth retardation in children and other physical and mental health conditions. The high prevalence of these infections is closely correlated with poverty, poor environmental hygiene, and impoverished health services [2].

The faecal oral route is significant in the transmission of parasitic infections to human via poor personal hygiene and environmental conditions such as contaminated soil and water sources. Worm infection is believed to be imposing an unnecessary burden on many Sudanese children and on the overall cost of health-care [3]. Disadvantaged children are the most affected, especially those who live in densely populated and under-serviced urban informal settlements as well as in some rural areas [4]. World Health Assembly (WHA) member states, including Sudan, were urged to implement regular, non-selective de-worming of school-age children and young women by 2010 in areas where the prevalence of worm infestation is 50% or more [5].

Currently, there is scarcity of available literature regarding the prevalence of parasitic infections from Khartoum state; therefore, little is known about intestinal parasitic infections in the inhabitants. The study was carried out to fill that gap. Therefore, the aim of this study was to determine the prevalence of intestinal parasites in primary school children of Khartoum state, Sudan [6].

Abdelsafi et al., in Elengaz Area, Khartoum, Sudan, and the overall prevalence of intestinal parasite infections was 64.4%. The common intestinal parasites were *Giardia lamblia*, *Hymenolepis nana*, *Taenia saginata*, *Entrobium vermicularis*, *Schistosoma mansoni* and *Entamoeba histolytica*. Most of infected children were suffering from single infection and two types of parasite. Many cases were being subclinical cases while the rest of infected children suffered from different clinical features associated with intestinal parasites such as nausea, abdominal pain, diarrhoea, flatulence, mucus, constipation, perianal itching, and bloody stool. The prevalence of intestinal parasite infection was high in primary school children; however, a considerable number of cases were asymptomatic [7].

Abdel-Aziz, et al., in Central Sudan, in total, 142 (90.4%) of 157 children harboured at least one type of intestinal parasite. *A. lumbricoides*, *H. nana*, *E. histolytica* and *G. lamblia* were the most common parasites found with prevalence rates 32.5%, 30.6%, 33.1% and 19.7%, respectively. Out of 157 children, 29 (18.5%) harboured more than two parasites [8].

A community based prospective study done in Khartoum State, Sudan in 1990 among randomly selected 300 under-five children from three camps of the police force. The study was planned to determine the prevalence and type of parasitic infestation among children. The overall prevalence was 44%. The commonest infestations were Giardiasis (21.1%), Taeniasis (10.4%) and Enterobiasis (7.4%). Non-pathogenic *E. coli*, *E. histolytica* and *Taenia saginata* were detected in (2.7%) in 2.7%, 0.7%, and 1.7% of stools specimen respectively. Children aged between three years and above were the most affected age group [9].

A study was conducted in Southern Sudan to determine the prevalence of intestinal parasites among school children.

A total of 275 stool sample were examined using formal-ether concentration techniques yielded 15 different species of parasites. Hookworm with a prevalence of (13.1%) was the predominant nematode followed by *S. mansoni* (2.2%) and *T. trichiura* (1.8%). Intestinal protozoans were common. *E. coli* (37.8%), *E. histolytica* (28.4%) and *G. lamblia* (9.8%) [10].

A school survey conducted by Salim in 1999 in Khartoum State to determine the prevalence of intestinal parasites infections among school children. It was done in urban setting (Arkawet) and rural area (Soba Alaradi). The findings revealed an overall prevalence rate was 37.5%. It was 35.7% and 39.4% in urban and rural areas, respectively. The commonest parasite was *G. lamblia*; it rates were 18.5% and 18.9% in urban and rural areas, respectively. The prevalence rates of other parasites were 12.4% and 15.4% for non-pathogenic *E. coli*, 8.3% and 8.5% for *H. nana*, 1.6% and 0.2% for *E. vermicularis* and 0.0% and 1.4% for *S. mansoni* in urban and rural areas, respectively.

Infections by a single parasite was found in 30.2% and 30% while by two parasites were in 5.7% and 9.2% of school children in urban and rural areas, respectively [11].

A study by Bannaga among street children in Khartoum to assess their health profile. Identified that the prevalence of intestinal parasites was 91.0%, giardiasis, flagellates and amoebic dysentery were the commonest accounting for 47.7%, 15%, 32% respectively [12].

In a study done by Elsadig to document the epidemiology and to identify the organisms that cause bloody diarrhoea in Sudanese children in Khartoum state, the commonest etiological organisms was *E. histolytica* (6.2%) [13].

A parasitological study by Babiker on a total of 1500 food handlers attending the public health laboratory (STAC) for annual check-up revealed that the overall infection of intestinal parasites was (30.5%). The commonest intestinal protozoa were *E. coli* (15.3%), whereas *G. Lamblia* was detected in (9.7%) and *E. histolytica* in only (4.3%) of the samples examined. Food handlers harbouring intestinal helminths constituted only (2.7%) [14].

Teklu, et al. found that overall prevalence of intestinal parasitic infections (single and multiple infections) was 39.9% in a community-based study conducted in area where is located at 505 km., South of Addis Ababa. Also in a study carried out by Rashid, et al., in primary school children in Bareilly district, found that the prevalence of intestinal parasite was 22.81% Sehgal, et al., Prevalence of Intestinal parasites was 42.8% in primary school children in Chandigarh, North India. Also, Ikram, et al., reported that in primary school children in rural Peshawar, approximately 66% were found positive for various intestinal helminths infestation [15].

Gashaw, et al. in Gondar Town, Northwest Ethiopia found the prevalent intestinal parasites were *A. lumbricoides*, *S. stercoralis*, *T. trichiura*, hookworm, and *G. lamblia*. *Giardia lamblia* was more frequent (33.4%) than other intestinal parasites. Tariq (2010) reported that in children in Thi-Qar, Southern Iraq, the prevalence of *Giardia lamblia* was 23.7%. These parasites are often associated with contaminated water and food [16].

**Rationale**

Intestinal parasitic infections are one of the biggest socioeconomic and medical problems. Epidemiological studies show that parasitic infections are among the most common infections and one of the biggest health problems of the society worldwide [7].

These infections because serious damage to children's development in non-developed countries and are related to failure to thrive, reduced physical activity and learning power.

Intestinal parasite infections lead to several complications, however, most of cases were being asymptomatic carriers and usually tend to be chronic. Helminthic infestation lead to nutritional deficiency and impaired physical developments which will have negative consequences on cognitive function and learning ability.

**Objectives of the study**

**General objectives:** To estimate the distribution of intestinal parasites among school children of Alhag yousif primary schools, Khartoum State, Sudan.

**Specific objectives**

- 1) To compare the sensitivity of wet preparation and formol-ether con tech for diagnosis of intestinal parasites.
- 2) To compare the distribution of intestinal parasites among school children according to gender.
- 3) To compare the distribution of intestinal parasites among school children according to age.
- 4) To compare the distribution of intestinal parasites among school children according to parasite.

**MATERIALS AND METHODS****Study area**

The study was conducted in the primary schools of Alhag Yousif, East Nile Locality, Khartoum State, Sudan.

**Study period**

The present study was conducted throughout the period from 1/12/2016 to 1/4/2017.

**Study population**

Male and female school children aged between 5-14 years from Alhag yousif, East Nile locality primary schools, Khartoum State, Sudan.

**Study design**

This was a cross-sectional school based study to estimate the distribution of intestinal parasites among school children.

**Sample size**

Stool samples were obtained from 120 school children, randomly selected.

**Specimen collection**

Stool specimens were collected from all school children. The specimens were collected following the quality control procedures. Apportion of the specimen was used for direct saline preparation; the other portion was fixed with 10% formol water v/v. for further concentration and staining techniques [17].

**Stool examination**

Macroscopical examination of stool: Faeces were examined macroscopically for faecal consistency and colour. These may vary with diet but certain clinical conditions associated with the parasite presence may show wet or loose stool consistency or even diarrhoea. The faeces were also examined for the presence of tapeworm segments or other helminths [18].

**Microscopical examination of stool**

**Wet mount:** All specimens were initially subjected to direct saline preparation. It was performed by suspending 2 mg to 5 mg (match-head size) of stool in few drops of 0.9% Sodium Chloride solution and then 1-2 drops of 1% eosin

solution were added to the suspension, if the consistency of the stool specimen was fluid. Otherwise Lugol's iodine was added. Then covered with cover slip and examined under the microscope using 10x eye piece and 10x objective for screening, and then 40x objective for identification [19].

### Formol-ether concentration technique

**Materials:** 10% Formol water, v/v, Diethyl ether, Sieve (strainer) with small holes, preferably 400  $\mu\text{m}$  - 450  $\mu\text{m}$  in size.

### Method

- 1) Using a rod or applicator stick, 1 g of faeces emulsified in about 4 ml of 10% (v/v) formol water contained in a screw cap bottle.
- 2) Another 3 ml of 10% formol water were added, the bottle was capped, and mixed well by shaking.
- 3) The emulsified faeces sieved, and the eluent was collected in beaker.
- 4) The suspension was then transferred to a conical tube made of strong glass, and 3 ml of diethyl ether added to this suspension.
- 5) The tube was stoppered and mixed for 1 minute. Then the stopper loosens and immediately centrifuged at (3000 rpm) for 1 minute.
- 6) The layer of faecal debris loosed from the side of the tube using an applicator stick and the faecal debris discarded and the formol water and the sediment remained.
- 7) The sediment was then transferred to a slide, and covered with a cover slip.
- 8) The preparation examined microscopically using the 10x eyepiece and objective for scanning the smear and using 40x objective for identification of cysts and eggs, as studied by Allen and Ridley in 1970 [20].

### Statistical analysis

After gathering the data including sex, age and parasite species, the data were analysed by SPSS 6.0 based on the study purposes. Chi-square test was used and t-test was used to compare quantitative variables.

## RESULTS

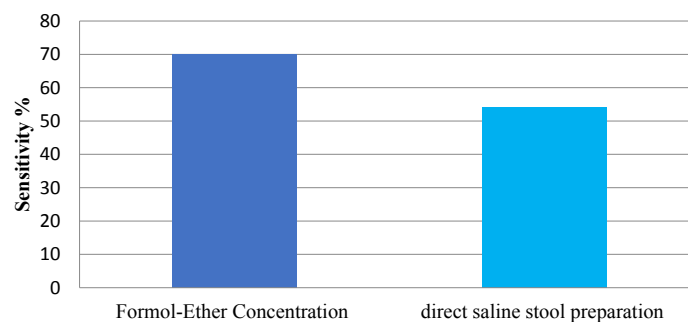
Results of comparative evaluation of stool examination techniques for detection of intestinal parasites.

A total of 120 stool samples were analysed by direct saline stool preparation and Formol-Ether Concentration Technique.

Results presented in Table 3 and Figure 3 shows that 34 (28.3%) stool samples were positive by the Formol-ether concentration technique and 18 (15.0%) were positive by direct saline stool preparation. Diarrhoea was present in 48 (40.0%) of total stool samples detected by macroscopical examination.

**Table 1 Results of comparative evaluation of stool examination techniques for detection of intestinal parasites**

Technique	Negative	Positive	Total
Direct saline stool preparation	55 (45.8%)	65 (54.2%)	120 (100%)
Formol-Ether Concentration Technique	36 (30%)	84 (70%)	120 (100%)

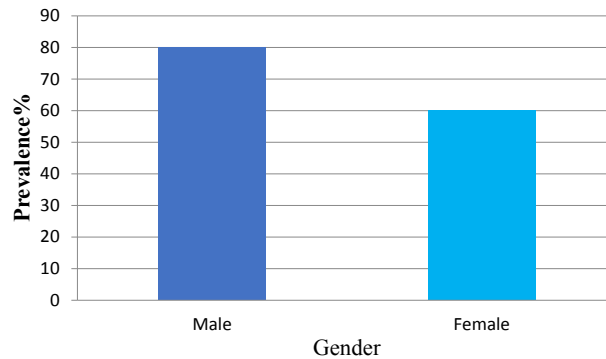


**Figure 1 Comparative evaluation of stool examination techniques for detection of intestinal parasites**

By using the Formol-Ether Concentration Technique (the most sensitive) the study found that intestinal parasites were more prevalent among the males (80%) than the females (60%) (Table 1, Figures 1 and 2).

**Table 2 The distribution of intestinal parasites among School children, according to the gender**

Gender	Number	Positive	Percentage
Male	60	48	80%
Female	60	36	60%

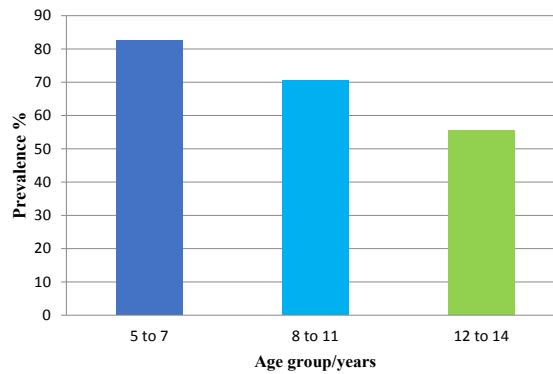


**Figure 2 The distribution of intestinal parasites among School children, according to the gender**

The study found that intestinal parasites were more prevalent among the age group 5 to 7 years old (55%) while it was less prevalent in age group 12 to 14 years old (33.3%) (Table 2 and Figure 3).

**Table 3 The distribution of intestinal parasites among school children, according to the age**

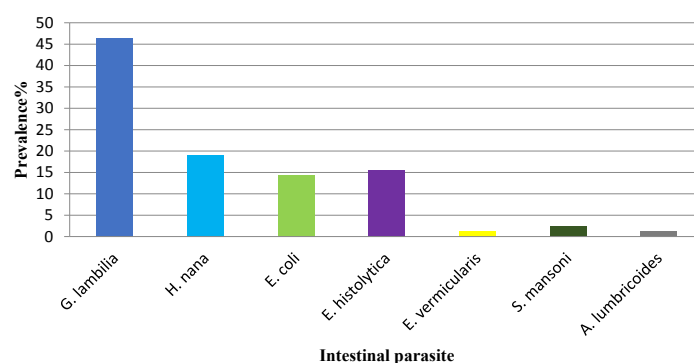
Age group/year	Number	Positive	Percentage
05-07	40	33	82.50%
08-11	44	31	70.50%
12-14	36	20	55.50%



**Figure 3 The distribution of intestinal parasites among school children, according to the age**

**Table 4 The distribution of intestinal parasites among school children, according to the parasite species**

Parasite spp.	Number	Percentage
<i>Giardia lamblia</i>	39	46.40%
<i>Hymenolepis nana</i>	16	19%
<i>Entamoeba histolytica</i>	13	15.50%
<i>Enterobius vermicularis</i>	1	1.20%
<i>Schistosoma mansoni</i>	2	2.40%
<i>Ascaris lumbricoides</i>	1	1.20%
<i>Entamoeba coli</i>	12	14.3



**Figure 4** The distribution of intestinal parasites among school children, according to the parasite species

The study found that *Giardia lamblia* was the most prevalent parasite among the school children (46.4%), Followed by *Hymenolepis nana* (19%). While the lowest prevalence was recorded for *Ascaris lumbricoides* and *Enterobius vermicularis* (1.2%) (Table 4 and Figure 4).

## DISCUSSION

Several studies of intestinal parasites have tended to focus on adults, with little or no emphasis on school children. This study found that Formol-Ether Concentration Technique is the most sensitive method for diagnosing the intestinal parasites. By using the most sensitive method, our study found that the infection rate of the intestinal parasites among school children of Alhag yousif, East Nile locality was 70%. While Abdel-Safi and Mohammed found that the infection rate among school children in Elengaz area was 64.4%. The study found that intestinal parasites were more prevalent among the male students (80%) than the females (60%), this may be an indication that the tow genders are not equally exposed to infection. In agreement to the findings of Ikram, et al. who found that intestinal parasites were more prevalent among the male students (37%) than the females (28%). On the other hand, the study found that intestinal parasites were more prevalent among the age group 5 to 7 years old (82.5%) this may be due to the low hygienic measurements of the youngest school children. While it was less prevalent in age group 12 to 14 years old (11.1%). Our study reported that the most prevalent intestinal parasite specie among the school children was *Giardia lamblia* (46.4%), Followed by *Hymenolepis nana* (19%). This is in agreement with Abdel-Safi and, Mohammed who found that *Giardia lamblia* (33.4%) and *Hymenolepis nana* (26.4%) were the most prevalent parasites among school children of Elengaz Area, Khartoum.

The clinical features associated with intestinal parasites were nausea, abdominal pain, diarrhoea, flatulence, mucus, constipation, perianal itching, and bloody stool. However, a considerable number of cases were remaining subclinical.

## CONCLUSION

This study concludes that Formol-Ether Concentration Technique is the best method for diagnosing intestinal parasites. Intestinal parasites were more prevalent among the age group 5 to 7 years old and more prevalent among the male students than the females and the most prevalent parasite is *Giardia lamblia*.

## Recommendations

1. Health education should include as a subject in the syllabus of primary schools.
2. To treat all infected school children to stop spreading parasites.
3. The use of the most sensitive technique for diagnosing intestinal parasitic infections should be established.

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