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Detection of Gastrointestinal Parasites Among Primary School Children By Using Different Parasitological Techniques in Rural of Kordofan State- Sudan

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Abstract: *In order to identify the prevalence rate of intestinal parasitic infections among primary school children, this cross-sectional study conducted in Almahana (Jafawa) village in Kordofan State. The study involved one hundred stool samples collected from children aged less than 12 years. By using direct wet preparation (DWP), triple direct wet preparation (3DWP), Zinc Sulphate floatation technique ($ZnSO_4$ FT) and formal ether concentration technique (FECT) to process the samples. The results showed that (45%) of children were harboring different gastrointestinal parasites. The study revealed that protozoa was seen in (64.4%), while helminthes and co-infection of protozoa and helminthes were seen in (24.4%) and (11.1%) respectively. Out of 45 positive cases, single parasite infections were found among 35 children (77.8%), were as (22.2%) children were found to be infected with multiple parasitic infections. When using different techniques for all samples of study population, FECT proved to detect higher rates of different parasites encountered. The highest rate (48.9%) was reported for G.lamblia, followed by Hymenolepis nana (22.2%), Entamoeba histolytica (4.4 %) and Entrobius vermicularis (2.2%). The results also showed that using of floatation technique could not recover a single case of Entamoeba histolytica. Although there was differences in detection of different parasites by different techniques, unfortunately these differences in rates were found to be statistically in significant with (p. value= 0.848). Gastrointestinal parasites were highly prevalent among primary school children (45%) in Kordofan State. FECT proved to have high sensitivity rate of detection of different gastrointestinal parasites.*

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Keywords— Intestinal parasite; Almahana village; Primary School; Kordofan; Intestinal protozoa

1. INTRODUCTION

Intestinal parasites are parasites that populate the gastrointestinal tract. The term is not merely a collective term but it can include a group of diverse parasites that vary greatly in many aspects e.g.: biology, pathology and epidemiology [1]. Gastrointestinal (GI) parasites contribute significantly to global levels of mortality. The world Health Organization (WHO) estimates that over two billions in the world are infected with at least one form of enters a pathogen, the majority of who reside in developing countries and in areas of poor hygiene. Poverty, illiteracy, poor hygiene, lack of access to potable water, and a hot and humid tropical climate are some of the common factors attributed to intestinal parasitic infections (IPI). About 39 million disability adjusted life years (DALYs) are attributed to IPI and thus, represents a substantial economic burden due to these infections [2]. School age children are particularly susceptible to parasitosis, often carrying higher burdens of parasites than adults [3]. Parasitic infections, caused by intestinal helminthes and protozoan parasites, are among the most prevalent infections in humans in developing countries. In developed countries, protozoan parasites more commonly cause gastrointestinal infections compared to helminthes [4]. Protozoa can be directly infectious for man when they are passed in the feces into the environment, but helminthes require a period of maturation while in the soil, where they become infectious. Others such as *Taenia saginata* require the involvement of an intermediate host during their life cycle. Infections of the GI tract account for a high proportion of deaths in infants where the standards of hygiene and nutrition are low. Fecal-oral transmission of the pathogens is the most common mode of GI infections, whereby water, food and hands become contaminated with fecal material which then come in contact with the mouth [5].

2. MATERIALS AND METHODS

2.1 Study design:

This was a cross-sectional community base study.

2.2 Study area and study period:

The study was conducted in Almahana village in Kordofan State-Sudan during period from April 2016 to October 2017.

2.3 Study population:

The study was carried out on100 students randomly selected with their age under 12 years old.

2.4 Sample size:

100 stool samples were collected from students under study.

2.5 Sampling collection:
Each selected student was provided with a labeled container which was transparent, clean and with wide mouth for faecal sample collection.

3. METHODS

3.1 Direct wet preparation (DWP):
Wet preparation was made by mixing small portion of stool taken with an applicator wooden stick with a drop of normal saline on slide and covered with cover slip and examined systematically under microscope using 10X and the high magnification 40X for observation of more details.

3.2 Triple wet preparation (3 DWP):
Direct wet preparation was done three times for each stool sample**.**

3.3 Formal ether concentration technique (FECT):
Approximately, one gram of feces was collected from different parts of the specimen and emulsified in 5 ml of formal saline in glass beaker. Further 5 ml from same solution was added and mixed. The resulting suspension was strained through the sieve. The filtered sample was poured back into a centrifuge tube and then equal volume of ether was added. The tube was mixed for one minute and then centrifuged for 5 minutes at 2000 rpm. All upper 3 layers were discarded and the sediment was transferred into slide which was covered with cover slip and examined under microscope using 10X and 40X magnifications.

3.4 Zinc Sulphate floatation technique ($ZnSO_4$ FT):
Approximately, half gram of feces was collected from different parts of the specimen and emulsified in long glass tube half filled with 33% Zinc sulphate solution and then the tube was filled with the same solution until convex shape was formed. Carefully, a cover glass was put and air bubbles were avoided. 30 to 45 minutes after, a cover glass was taken and put on clean and dry slide and examined under microscope using 10X and 40X magnifications.

3.5 Data analysis:
The data was analyzed using statistical package for social science (SPSS). Then data were presented in tables and figures.

3.6 Ethical consideration:
Approval for study was taken from the school's managers and students.

4. RESULTS

The results showed that out of the 100 primary school children, 45 were found infected with gastrointestinal parasites. This constituted an overall infection rate of 45% (Figure 1). The overall prevalence of gastrointestinal parasite among study population by using different techniques, 31 were found by wet preparation (31.0%), 33 by triple preparation (33.0%), 38 by zinc sulphate (38.0%) and 45 by formal ether concentration technique (45.0%) (Figure 2). The results revealed that protozoa was seen in 29 (64.4%), while helminthes and co-infection of protozoa and helminthes were seen in 11 (24.4%) and 5 (11.1%) respectively (Figure 3). In comparison between single parasitic infection and co- infection, the results showed that high prevalence rate 35 (77.8%) were single infection and low prevalence rate 10 (22.2%) were co-infection (Figure 4). The result also showed the highest prevalence rate (48.9%) of single parasitic infection was *G.lamblia* followed by *H.nana* (22.2%), *E.histolytica* (4.4%) and *E.vermicularis* (2.2%) (Table 1) and the highest prevalence rate (11.1%) of multiple parasitic infection (co-infection) was *G.lamblia* + *E.histolytica* followed by *G.lamblia*+ *H.nana* (6.7%), *E.histolytica*+ *H.nana* (2.2%) and *G.lamblia*+ *E.vermicularis* (2.2%) (Table 2). When using different techniques for all samples of study population, formal ether concentration technique proved to detect higher rates of different parasites encountered (Table 3). The highest rate (32.0%) was reported for *Girdia lamblia*, followed by *Hymenolepis nana* (10.0%), *Entamoeba histolytica* (2.0%) and *Enterobius vermicularis* (1.0%). The table also showed that using of floatation technique could not recover a single case of *Entamoeba histolytica*.

Figure 1: The overall prevalence of gastrointestinal parasites among school children

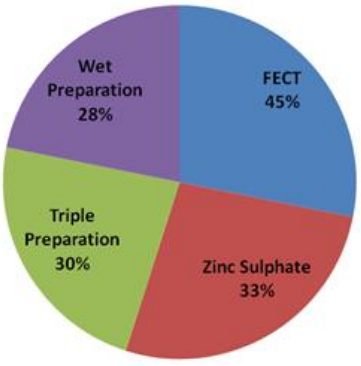

Figure 2: The overall prevalence of gastrointestinal parasites among school children by using different techniques

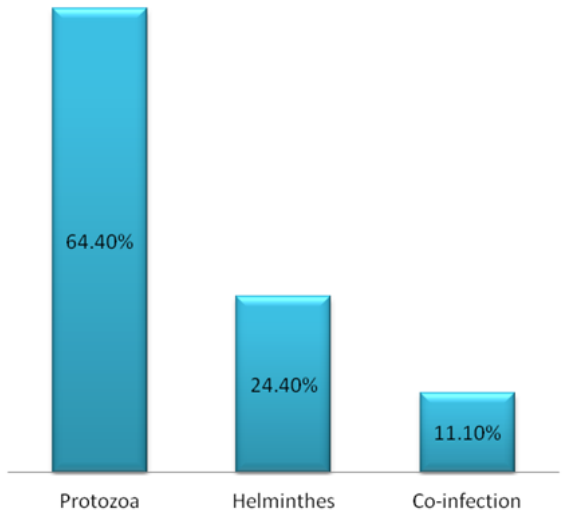

Figure 3: The prevalence of protozoa, helminthes and co-infections

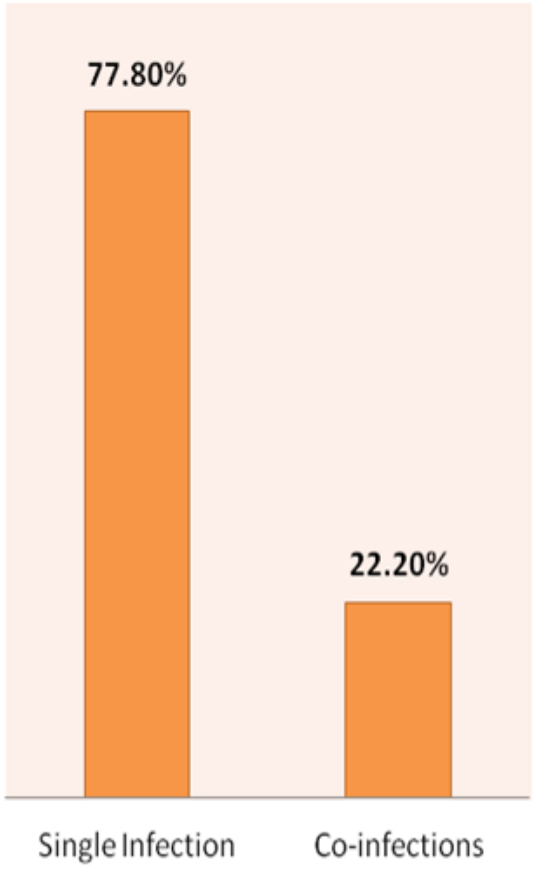

Figure 4: Comparison between single and co-infections

Table 1: Prevalence of single parasitic infection

Parasite	No. examined	No. positive	Prevalence %
E.histolytica	100	2	4.4%
G.lamblia	100	22	48.9%
H.nana	100	10	22.2%
E.vermicularis	100	1	2.2%

Table 2: Prevalence of co-infections

Parasites	No. examined	No. positive	Prevalence %
G.lamblia+ E.histolytica	100	5	11.1%
G.lamblia + H.nana	100	3	6.7%
E.histolytica+ H.nana	100	1	2.2%
G.lamblia+ E.vermicularis	100	1	2.2%

Table 3: Comparison between different techniques in detection of each parasite

Parasite	No. Examined	+ve (DWP)	+ve (3DWP)	+ve ($ZnSo_4FT_)$	+ve (FECT)
E.histolytica	100	1.0%	1.0%	0%	2.0%
G.lamblia	100	17.0%	19.0%	22.0%	32.0%
H.nana	100	10.0%	10.0%	10.0%	10.0%
E.vermecularis	100	0%	0%	1.0%	1.0%

5. Discussion

From the results, it is obvious that the overall prevalence rate of gastrointestinal parasites among primary school children was 45.0% which was high prevalence rate and may attributed to the primitive environmental condition of the area in addition to poor quality of life and behavior. This rate was found to be higher than the rate (30%) reported by Muhajir *et al*. (2017) [6] in Al-kalakal area, Khartoum State. However, our rate was found to be lower than the rate (64.4%) reported by Gabbad and Elawad (2014) [7] in Elengaz area, Khartoum State. These and other studies give the evidence of spread of intestinal parasites among school children in different regions. The multiple parasitic infection rates (co-infection) in this study were (22.2 %) which lower than other study done by Bisht *et al.* (2011) [8] in India who

were found a higher prevalence rate (30.40%) with double parasites. The findings of this study indicated that the common intestinal parasites in primary school children were *Giardia lamblia*, *Hymenolepis nana*, *Entrobius vermicularis*, and *Entamoeba histolytica*, also Gashaw *et al*. (2008) [9] found *Giardia lamblia* was more frequent (33.4%) than other intestinal parasites. These variable results in the prevalence of parasites (helminthes, protozoa, single infection and even co-infection) were reflection of the local endemicity, sanitary standard, environmental conditions, timing and seasonal differences in the design of the survey work and personal hygiene (Chiaozie *et al.*, 2007) [10]. Different prevalence rates among all study population were reported by different techniques, although there was differences in detection of different parasites unfortunately these differences in rates were found to be statistically in significant with (p. value= 0.848). From the results obtained from the present study we recommended that implementation of health education program for primary school children and personal hygiene to the students and to the parents. An extensive screening with increase in sample size should be cover all primary school children and use of formal ether concentration technique as most reliable technique for detection of different parasitic infections instead of wet preparation in routine diagnosis.

6. Conclusion:

This study concluded that the gastrointestinal parasites were highly prevalent among primary school children (45%) in Kordofan state. The prevalence rate of intestinal protozoa was higher than intestinal helminthes. Also the prevalence rate of single infection was higher than co-infection. *Giardia lamblia* was the most common parasites that detected in the study population. Formal ether concentration technique proved to have high sensitivity rate of detection of different gastrointestinal parasites.

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