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Intestinal protozoa and intestinal helminthic infections among schoolchildren in Central Sudan

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ABSTRACT

Objective: To determine the prevalence of intestinal parasitic infections and soil-transmitted helminths (STHs) among primary schoolchildren in El dhayga, Central Sudan. **Methods:** In this cross-sectional study, three fresh faecal samples were collected from each child, which were examined by direct wet mount, brine flotation, formalin-ether and Kato-Katz techniques. The intensity of each STH infection was expressed as the mean of eggs per gram counts of the three samples. **Results:** In total, 142 (90.4%) of 157 children harboured at least one type of intestinal parasite. *Ascaris lumbricoides*, *Hymenolepis nana*, *Entamoeba histolytica* and *Giardia lamblia* were the most common parasites found, with prevalence rates of 32.5%, 30.6%, 33.1% and 19.7%, respectively. Out of these 157 children, 29(18.5%) harboured more than two intestinal parasitic infections. No cases of *Schistosoma mansoni* or *Enterobius vermicularis* were identified. **Conclusions:** The study demonstrates significant burden of intestinal protozoa and STH infections in this part of Sudan and highlights the need for preventive and intervention measures.

1. Introduction

Intestinal protozoa and soil-transmitted helminths (STHs) are one of the major problems of health worldwide[1]. Children are more vulnerable to intestinal protozoa and STHs. These infections contribute to growth stunting, reduced physical activity, anaemia and impaired educational performance among children[1]. Furthermore, these infections might also increase host susceptibility to other important illnesses such as malaria, tuberculosis, and HIV infection[2,3]. In 2001, the World Health Assembly passed a resolution urging member states to control the morbidity of STHs infections through large-scale use of anthelmintic drugs for school-aged children in less developed countries[4]. While much interventions guided by epidemiological data concerning intestinal protozoa and STHs in most African countries, few published data available for Sudan[5], the largest African country with 40 million populations[6]. Thus, the current study was conducted to determine the prevalence of intestinal parasitic infections and STHs among primary schoolchildren in El dhayga, Central Sudan so as to provide health planners and care-givers with fundamental data necessary for interventions.

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2. Materials and methods

A cross sectional study was conducted in El dhayga in Central Sudan during October 2008. The study was based in elementary school (for both boys and girls). The permission of the Education and Health Vice Chancellor and the village head (sheikh) in the study area was obtained. Then the school authority and parents/guardians of children were approached for participation in the study. The study received ethical clearance from the Research Board at the Faculty of Medicine, University of Khartoum.

Three fresh faecal samples were collected from each child, which were examined by direct wet mount, brine flotation, formalin-ether and Kato-Katz techniques[7]. The intensity of each STH infection was expressed as the mean of eggs per gram counts of the three samples. Albendazole tablets were used for a 3-day course of 400 mg/daily. Data were entered in computer using SPSS version 13.0 for windows and double checked before analysis. Percentages were calculated and compared between the groups using χ^2 test, $P < 0.05$ was considered significant.

3. Results

During the study, 157 (91.2%) out of 172 student provided their faeces for examinations. In total, 142 (90.4%) of the 157 screened children harboured at least one type of

Table 1
Prevalence and intensity of intestinal parasite in in El dhayga, Central Sudan (*n*, %).

Parasite		Male (*n*=82)	Female(*n*=75)	Total(*n*=157)
At least one type of intestinal parasite		62(75.6)	53 (70.7)	142 (90.4)
More than two types of intestinal parasite		16 (19.5)	13 (17.3)	29 (18.5)
Ascaris lumbricoides	Prevalence	27 (32.9)	24 (32.0)	51 (32.5)
	Intensity(Egg count)	4 454 (1.6)	4 343 (1.9)	4 362 (1.7)
Hymenolepis nana	Prevalence	30 (36.6)	18 (24.0) *	48 (30.6)
	Intensity (Egg count)	3 265 (1.4)	3 208 (1.5)	3 212 (1.5)
Ancylostoma duodenale	Prevalence	7 (8.5)	5 (6.6)	12 (7.6)
	Intensity (Egg count)	3 122 (6.4)	3 210 (6.5)	3 012 (6.8)
Trichuris trichiura	Prevalence	6 (7.3)	4 (5.3)	10 (6.3)
	Intensity (Egg count)	3 565 (1.6)	3 208 (1.6)	3 222 (1.5)
Giardia lamblia		31 (37.8)	21 (28.0) *	52 (33.1)
Entamoeba histolytica		18 (22.0)	13 (17.3)	31 (19.7)

Data were shown as *n* (%) or mean (SD) as applicable and * means significant difference.

intestinal parasite. *Ascaris lumbricoides*, *Hymenolepis nana*, *Entamoeba histolytica* and *Giardia lamblia* were the most common parasites found, with prevalence rates of 32.5%, 30.6%, 33.1% and 19.7%, respectively. Out of these 157 children, 29 (18.5%) harboured more than two intestinal parasitic infections. The details prevalence and the intensity of the detected intestinal parasite were shown in Table 1. The prevalence rate of *Hymenolepis nana* and *Giardia lamblia* were significantly higher among boys in comparison to that in girls, while the prevalence rate and intensity of the other intestinal parasites were not significantly different between boys and girls (Table 1). No statistically significant difference was observed among presence of intestinal parasites and age (data were not shown). No cases of *Schistosoma mansoni* or *Enterobius vermicularis* were identified.

4. Discussion

The study revealed a high prevalence (90.4%) of intestinal parasite –mainly *Ascaris lumbricoides*, *Hymenolepis nana*, *Entamoeba histolytica* and *Giardia lamblia* among these children. There was no difference in the prevalence rate between sex and age. The high prevalence of these intestinal parasites was higher than what we recently observed among schoolchildren in eastern Sudan [6] or even higher than what was reported among children in Kassala, eastern Sudan[8] and southern Sudan[9]. Yet, results of the current study are comparable with reports from other African countries[10]. The reason for the lower prevalence of *Trichuris* and high prevalence of *Ascaris lumbricoides* in this study is not completely understood. One possible hypothesis could be the climatic conditions, especially rainfall, humidity and soil. Temperature may favour the development of ova into the infective stage in the soil, but *Ascaris* eggs are highly resistant to dryness and temperature fluctuations[11]. There was no case of *Enterobius vermicularis* detected in this survey, possibly because perianal sampling is necessary[12]. Thus, regular screening of children for intestinal parasite to enhance efforts at early diagnosis and treatment that could potentially decrease the incidence and intensity of these parasites and to emphasize the need for additional socio-cultural researches to formulate appropriate educational interventions for the community to limit transmission. Provision of good housing, safe water supply and latrine facilities, as well as environmental sanitation, personal hygiene and clean practices could be employed in the prevention of these diseases. Mass chemotherapy alone may not be useful for STHs. In highly endemic areas, re-infection can occur as early as 2 months post treatment and by 4 months, half of the treated population may be re-infected [13]. Thus, our study demonstrates the significant burden of intestinal protozoa and STH infections in this part of Sudan and highlights the need for preventive and intervention measures (deworming programs).

Conflict of interest statement

We declare that we have no conflict of interest.

References

[1]WHO. *Deworming for health and development. Report of the third global meeting of the partners for parasite control*. Geneva: World Health Organization; 2005.
[2]Fincham JE, Markus MB, Adams VJ. Could control of soiltransmitted helminthic infection infl uence the HIV/AIDSpandemic? *Acta Trop* 2003; **86**: 315–33.
[3]Le Hesran JY, Akiana J, Ndiaye el HM, Dia M, Senghor P, Konate L. Severe malaria attack is associated with high prevalence of Ascaris lumbricoides infection among children in rural Senegal. *Trans R Soc Trop Med Hyg* 2004; **98**: 397–9.
[4]Horton J. Global anthelmintic chemotherapy programs: learning from history. *Trends Parasitol* 2003; **19**: 405–99.
[5]Riesel JN, Ochieng' FO, Wright P, Vermund SH, Davidson M. High prevalence of soil-transmitted helminths in Western Kenya: failure to implement deworming guidelines in rural Nyanza province. *J Trop Pediatr* 2010; **56**(1): 60–2.
[6]Mahgoub HM, Mohamed AA, Magzoub M, Gasim GI, Eldein WN, Ahmed AA, et al. Schistosomiasis mansoni and anaemia among primary school children of eastern Sudan. *J Helminthology* (in press).
[7]Garcia LS, Bruckner DA. *Diagnostic medical parasitology. Macroscopic and microscopic examination of fecal specimens*. Washington, DC: American Society for Microbiology; 1993, p.501–40.
[8]Mohamed MM, Ahmed AI, Salah ET. Frequency of intestinal parasitic infections among displaced children in Kassala Town. *Khart Med J* 2009; **2**:175–7.
[9]Magambo JK, Zeyhle E, Wachira TM. Prevalence of intestinal parasites among children in southern Sudan. *East Afr Med J* 1998; **75**: 288–90.
[10]Kabatereine NB, Kemijumbi J, Kazibwe F, Onapa AW. Human intestinal parasites in primary school children in Kampala, Uganda. *East Afr Med J* 1997; **74**: 311–4.
[11]Hunter GW, Swartzwelder JC, Clyde DF. *Tropical medicine*. 5th ed. Philadelphia: WB Saunders; 1976, p. 465–71.
[12]Mosala TI, Appleton CC. True prevalence of the pinworm (Enterobius vermicularis) among children in Qwa-Qwa, South Africa. *S Afr J Sci* 2003; **99**: 465–6.
[13]Norhayati M, Zainuddin B, Mohammod CG, Oothuman P, Azizi O, Fatmah MS. The prevalenceof *Trichuris*, *Ascaris* and hookworm infections in Orang Asli children. *Southeast Asian J Trop Med Public Health* 1997; **8**: 161–8.