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Intestinal Parasitic Infection Among Children in the Kingdom of Saudi Arabia

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Abstract: Intestinal parasitic infections are endemic worldwide and have been described as constituting the greatest single worldwide cause of illness and disease. This study determines extend of intestinal parasitic infection in Tabuk children, for effective treatment and prevention of spread in the environment. Eight hundred and twelve children 2–12 years of age were enrolled in a cross-sectional survey after parental informed consent, in the period between March 2009 and November 2009 in Tabuk, Kingdom of Saudi Arabia. The study involved examination of fecal samples from children. A simple random sample of stool was collected. The samples were examined by direct wet films, concentration techniques and staining methods e.g. modified Ziehl Neelsen staining method. In this study we detected six types of parasites. The overall infection rate was 8.4 %, as intestinal parasitic infection is still a problem among children in the Kingdom of Saudi Arabia.

Key words: Children, intestinal parasitic infection, KSA.

INTRODUCTION

Intestinal parasitic infections are endemic worldwide and have been described as constituting the greatest single worldwide cause of illness and disease (Mehraj *et al.*, 2008 and Steketee, 2003), but the resources available for their control are severely limited (Bundy *et al.*, 1992). It is still a common health problem among children in Saudi Arabia (Al-Braiken, 2008). Environmental, socio-economic, demographic and health-related behavior is known to influence the transmission and distribution of these infections (Norhayati *et al.*, 2003). Children are among the most vulnerable to environmental threats as they are in a dynamic state of growth with their cells multiplying fast and their organ systems developing at a rapid rate (WHO, 2003). The morbidity of intestinal parasitic infections is greatest among children of school age and may have an adverse effect on growth (Nematian *et al.*, 2008). Worm infestation is a major problem in children from developing countries. It produces nutritional deficiencies and anemia in children, especially when hookworm infestation is present (Ahmed *et al.*, 2003 and Ananthakrishnan *et al.*, 1997). Work by WHO and other international key players shows that there is real potential for improving child health and creating a better future for the coming generations through scaling up action to confront environmental dangers (WHO, 2003).

MATERIALS AND METHODS

Sampling Techniques:

Stool samples were collected from pupils from the various primary and nursery schools chosen for the study. Early stool samples were put into scrupulously cleaned sample bottles which were collected for processing and examination. Permission to collect samples was taken from the primary school pupils, their teachers and their parents.

Parasitological Technique:

Diagnosis of intestinal parasites is confirmed by the recovery of protozoan trophozoites and cysts, helminthes eggs and larvae in the clinical parasitology laboratory. Microscopic examination of faeces is essential for the recognition and identification of intestinal parasites. Due to the low density of the parasites in the faeces, direct microscopy is useful for the observation of motile protozoan trophozoites and the examination of cellular exudates, is not recommended solely for the routine examination of suspected parasitic infections. It is essential to increase the probability of finding the parasites in faecal samples to allow for an

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accurate diagnosis. Therefore, a concentration method is employed. Direct wet mount examination should not be entirely excluded as the trophozoites are usually destroyed during the concentration procedure and therefore, microscopic examination of wet mounts should be performed (Arcari *et al.*, 2000).

The method adopted for direct smear, formol-ether concentration and floatation techniques and ZN stain were supplied by WHO (1991) and that described by Cheesbrough (2005).

Identification of Intestinal Parasites:

The parasites are confirmed and identified by medical laboratory research staff in accordance with the bench aid for diagnosis of intestinal parasites.

Statistical Analysis:

Data was fed into a Microsoft Excel table which was used to construct tables and figures. The Statistical Package for Social Sciences (SPSS), version 16.0 program was used to form the statistical analysis.

Results:

The children enrolled were stratified to include seven groups of children first one less than six years of age (7.9%), three groups 6-9 years (52.1 %) and another three groups of children aged10–12 years old (40.0 %). Total numbers of boys were 404 (48.8%) and girls were 408 (52.2 %). Table (1) and Fig. (1) show the total sample included 812 children, 8.4 % of whom were infected with one or more of the six parasites present. Multiple infections were not common and were detected in only 0.2%. The mean prevalence of protozoal infection is 7.4% and for helmenthic infection is 1.2%. The age group of 6 years show maximum frequency of parasitic infections (2%) and lowest with age group 2-6 (0.5%).

The frequency of pathogenic intestinal parasite was more in males than in female. The parasites, found in descending order of frequency, *Entameoba histolytica, Giardia lamblia, Cryptosporidium, H. nana, Ascaris lumbricoid and Entrobius vermicularis*. Total infection rate in boys (4.4%) was higher than girls (3.9%).

Tables (2 & 3) and fig. (2) show that six parasitic infections were diagnosed in our study. The infection frequency with *Entameoba histolytica, Giardia lamblia, Cryptosporidium, H. nana, Ascaris lumbricoid and Entrobius vermicularis* were 4.8, 1.8, 0.6, 0.6, 0.5 and 0.1 % respectively. The highest infection frequency identified with *Entameoba histolytica* at age group 12 years (1.5%). The lowest infection frequency identified at age group 2-6 years (0.5%) and the highest infection frequency identified at age group 6 years (2.0 %). *H. nana* diagnosed only at age of 8 years (0.6 %) and *E. vermicularis* diagnosed only at age of 10 years (0.1 %). Mixed infection was seen in 0 .2 % of the children. In these cases infection with *H. nana* and *Entameoba histolytica* were present.

Table 1: Prevalence of parasitic infection according to age and gender.

Age	No. examined				No. infected				Total			
(Years)	Male	%	Female	%	Male	%	Female	%	Examined	%	Infected	%
2-6	30	3.7	34	4.2	2	0.2	2	0.2	64	7.9	4	0.5
6	96	11.8	50	6.2	10	1.2	6	0.7	146	18.0	16	2.0
7	52	6.4	51	6.3	4	0.5	4	0.5	103	12.7	12	1.5
8	64	7.9	44	5.4	8	1.0	2	0.2	108	13.3	10	1.2
9	40	4.9	26	3.2	2	0.2	2	0.2	66	8.1	4	0.5
10	42	5.2	69	8.5	2	0.2	4	0.5	111	13.7	6	0.7
11	48	5.9	52	6.4	6	0.7	2	0.2	100	12.3	8	1.0
12	32	3.9	82	10.1	2	0.2	10	1.2	114	14.0	12	1.5
Total	404	49.8	408	50.2	36	4.4	32	3.9	812	100.0	68	8.4

The total sample included 812 children, 8.4 % of whom were infected with one or more of the six parasites present.
The mean prevalence of boys infection is 4.4% and for girls infection is 3.9%.

Discussion:

There was a low prevalence of intestinal parasitic infection (8.4%) in the present study. Higher rates have been reported from Quetta, Pakistan (Wadood *et al.*, 2005). Much higher rates have been reported from Bangladesh and Yemen (Menan *et al.* 1997). This difference could be due to dry climate and comparatively better living conditions in Tabuk. Al-Braiken 2008 detected higher prevalence in Jeddah, but it was from inpatients and outpatients complaining from gastroentrites.

The prevalence of *E. histolytica* was 4.8 % in this study. Its prevalence varies in different countries and is common in underdeveloped countries where it is considered to be the third leading cause of death. Overall

Table 2: Prevalence of protozoal infection in examined children.

Age (y)		No. ex. %	Infected %	E. hist. %	G.lamblia %	Cryptosp. %
2-6	M	3.7	0.2	0.2	-	-
	F	4.2	0.2	-	-	0.1
	T	7.9	0.5	0.2	-	0.2
6	M	11.8	1.1	-	0.9	0.2
	F	6.2	0.7	0.2	0.2	0.2
	T	18.0	1.8	0.2	1.1	0.5
7	M	6.4	0.5	0.5	-	-
	F	6.3	0.5	-	0.5	-
	T	12.7	1.0	0.5	0.5	-
8	M	7.9	0.7	0.5	0.2	-
	F	5.4	0.2	0.2	-	-
	T	13.3	1.0	0.7	0.2	-
9	M	4.9	0.2	0.2	-	-
	F	3.2	0.2	0.2	-	-
	T	8.1	0.5	0.5	-	-
10	M	5.2	0.2	0.2	-	-
	F	8.5	0.2	0.2	-	-
	T	13.7	0.5	0.5	-	-
11	M	5.9	0.2	0.5	-	-
	F	6.4	0.2	0.2	-	-
	T	12.3	0.7	0.7	-	-
12	M	3.9	0.2	0.2	-	-
	F	10.1	1.2	1.1	-	-
	T	14.0	1.5	1.5	-	-
Total	M	49.8	3.7	2.5	1.1	0.2
	F	50.2	3.7	2.3	0.7	0.4
	T	100.0	7.4	4.8	1.8	0.6

No. ex.: No. examined, E. hist.: Entameba histolytica,
G.lamblia: Giardia lumblia, cryptosp.: cryptosporidium, M: male, F:female.

Table 3: Prevalence of helmenthic infection in examined children.

Age (y)		No. ex. %	Infected %	H. nana %	A. lum. %	E. verm. %
2-6	M	3.7	-	-	-	-
	F	4.2	-	-	-	-
	T	7.9	-	-	-	-
6	M	11.8	0.2	-	0.2	-
	F	6.2	-	-	-	-
	T	18.0	0.2	-	0.2	-
7	M	6.4	-	-	-	-
	F	6.3	-	-	-	-
	T	12.7	-	-	-	-
8	M	7.9	0.4	0.4	-	-
	F	5.4	0.2	0.2	-	-
	T	13.3	0.6	0.6	-	-
9	M	4.9	-	-	-	-
	F	3.2	-	-	-	-
	T	8.1	-	-	-	-
10	M	5.2	-	-	-	-
	F	8.5	0.1	-	-	0.1
	T	13.7	0.1	-	-	0.1
11	M	5.9	0.2	-	0.2	-
	F	6.4	0.0	-	-	-
	T	12.3	0.2	-	0.2	-
12	M	3.9	-	-	-	-
	F	10.1	-	-	-	-
	T	14.0	-	-	-	-
Total	M	49.8	0.9	0.4	0.5	-
	F	50.2	0.4	0.2	-	0.1
	T	100.0	1.2	0.6	0.5	0.1

No. ex.: No. examined, H.nana: Hymenlepis nana, Ascaris lumbricoid,
Entrobius vermicularis, M: male, F: female.

about 10% of the world population is estimated to be infected by this parasite (Akhund *et al.*, 1994 and Wadood *et al.*, 2005). The prevalence of *Cryptosporidium, H. nana*, *Ascaris lumbricoides*, and *Enterobius vermicularis* was so low. It is not worthy that other nematodes such as *Ankylostoma duodenale, S. stercolaris* and *T. tichiura* were not detected from Tabuk. The low prevalence of *Ascaris lumbricoides* and *Ankylostoma duodenale* and absence of strogyloides stercolaris has been also reported in children of Saudi Arabia (Al-Ballaa *et al.*, 1993).

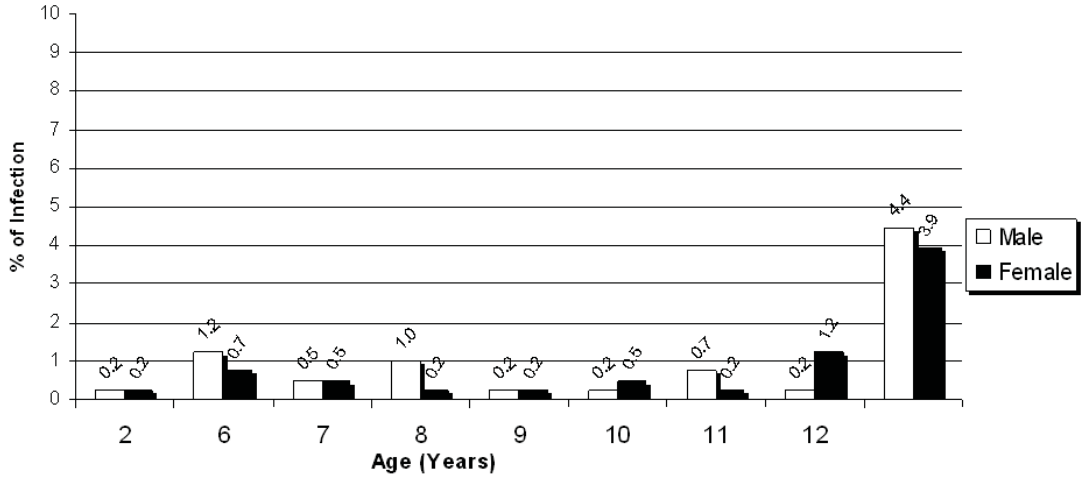

Fig. 1: Prevalence of Parasitic Infection; Gender and Age Grouped. Seven groups of children first one from two to six years of age, the six groups 6,7,8,9,10,11,12 years old. Total number of boys was 404 (48.8%) and girls was 408 (52.2 %).

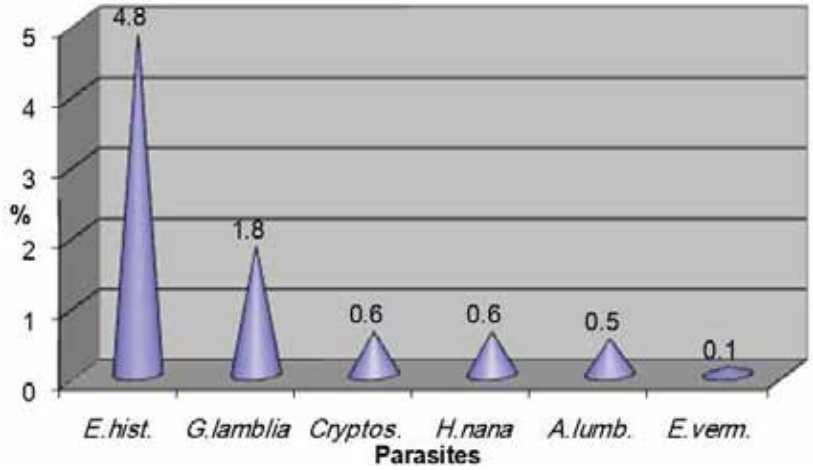

Fig. 2: Diagnosed Parasites. *E. hist.: Entameba histolytica, G. lamblia: Giardia lumblia, cryptosp.: cryptosporidium. H. nana: Hymenlepis nana, Ascaris lumbricoid, Entrobius vermicularis*.

Educational level, tanker as source of water and open sewage disposal were independently associated with high intestinal parasitic infection (Al-Shammari *et al.*, 2001).

The cross-sectional study design does not allow us to obtain some potentially important information, such as the temporal sequence of parasitosis, malnutrition, and developmental disabilities in any individual child. This information will be crucial to further support the hypothesis that parasitic infection led to malnutrition, and malnutrition was then a factor contributing to developmental disabilities. A longitudinal, cohort study would be necessary to provide this crucial next piece of information. Many developmental delays in children from developing countries are multifactorial. However, these associations are intriguing from the standpoint of public health practice, and the impact of both malnutrition and intestinal parasitic infection on developmental delays requires further study.

Conclusion:

Intestinal parasitic infection is present among children of Tabuk. *E. histolytica* is the common parasite in the region. Prompt preventive measures should be taken for the eradication of these infections, which should include public health education, clean water supply, promoting personal hygiene and periodic deworming of the children. It can be concluded from this study that Intestinal infection is present among children in Tabuk and might be one of the reasons of anemia and malabsorption in this group.

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