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Prevalence of Intestinal Parasitic Infection in School Going Children in Amalapuram, Andhra Pradesh, India

Rangaiahagari Ashok [1,*]; Giddi Suguneswari [2]; Ksbvn Satish [2]; Vedantham Kesavaram [2]

[1]King Faisal Hospital, Rwanda, East Africa
[2]Department of Microbiology, Konaseema Institute of Medical Sciences and Research Foundation, Amalapuram, Andhra Pradesh, India

*Corresponding Author: Rangaiahagari Ashok, King Faisal Hospital, Rwanda, East Africa. Tel.: +250-783099128, E-mail: ashokrnims@gmail.com

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Background: The public health impact of parasitic infection has been consistently underestimated in the past, but there is now a general consensus that diseases caused by intestinal parasites represent an important public health problem, especially children. Recent studies suggest that even moderate intensity of infection may have adverse effects on growth, iron deficiency anemia and cognitive function, practically for children of school age.

Objective: Aim of the present study was to determine the intestinal parasitic infection in school going children.

Materials and Methods: The stool samples were collected from different municipal school in and around Amalapuram according to the standard procedures between June 2006 to August 2006. All the stool samples were examined by the direct microscopic examination and by the formalin-ether concentration methods. Analysis of the data was carried out by using Epi info software.

Results: A total 208 stool specimen were collected. The mean age group was 8.8 ± 2.11. 133 (63.9%) were infected with one or more intestinal parasites. 95 (71.4%) of the students were infected with single parasite, 38 (28.6%) with two or more parasites. The most common was *Entamoeba histolytica (E.histolytica)* with 41 (30.8%) single and 26 (19.54%) with multiple infections. The second most common was *Giardia intestinalis* (*G.intestinalis*) with 25 (18.8%) single and 25 (18.8%) with multiple infections. The third one was *Entamoeba coli* (*E.coli*) with 15 (11.3%) single and 17 (12.78%) with multiple infections. *E.histolytica* and *G.intestinalis* were the most commonly found parasite in multiple infections. 1.5% of *Ascaris lumbricoides*, 5.3% *Hookworm*, 0.8% *Enterobius vermicularis* and 0.8% of *Trichuris trichuria* were found in the stool sample.

Conclusions: Intestinal parasitic infection is an important public health problem in Andhra Pradesh, India. Rural residence, mother education less than primary school and no hand wash with soap after toilets were the significant risk factors. Interventions including health education on personal hygiene, appropriate water management like boiling and use of latrines to the school children and to the parents.The public health impact of parasitic infection has been consistently underestimated in the past, but there is now a general consensus that diseases caused by intestinal parasites represent an important public health problem, especially children. Recent studies suggest that even moderate intensity of infection may have adverse effects on growth, iron deficiency anemia and cognitive function, practically for children of school age.

Keywords: Intestinal Parasite; Entamoeba Histolytica; School Children; Konaseema Institute of Medical Sciences

1. Background

Parasitic diseases have been with mankind since time immemorial. Even today, these diseases remain among the major cause of human misery and death in the world and are important obstacles to the development of economically less favoured countries. Intestinal parasitic infections are the most common infections worldwide. 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. The public health impact of parasitic infection has been consistently underestimated in the past, but there is now a general consensus that diseases caused by intestinal parasites represent an important public health problem, especially children. Recent studies suggest that even moderate intensity of infection may have adverse effects on growth, iron deficiency anemia and cognitive function, practically for children of school age (1, 2).

Like other developing countries, intestinal parasite infections are major health problems in India. Epidemiological surveys on the intestinal parasite infections are important in this country because they reflect sanitary conditions of the community and produce basic data for the control of parasitosis in the future. The most common intestinal parasitic infections in the world are *Ascaris lumbricoides*, *Trichuris trichuria* and *Hook worms* (3). *Ascaris lumbricoides* was the most common parasite found in India followed by *Hookworm*, *Hymenolepis nana*, *Tapeworm*, *Trichuris trichiura*, *Enterobius vermicularis, Entamoeba histolytica, Entamoeba coli* and *Giardia lamblia* (4). Majority of them had helminthic infections. But national data on prevalence of infection among children is lacking.

A study from India revealed a high prevalence of intestinal parasitic infections (29.2) (4). However all the studies were performed in the general population. Although

there are various studies on interactions between infection and socio-demographic, environmental factors, and behavioral habits from different countries and other parts of the country, to our knowledge, there is lack of adequate information for the East Godavari district, AP, India.

2. Objectives

The current study was to know the prevalence of intestinal parasitic infection in school going children in and around Amalapuram.

3. Materials and Methods

This prospective study was carried out in the department of microbiology, Konaseema Institute of Medical Sciences & Research Foundation (KIMS & RF), Amalapuram, EG dist, AP. The stool samples were collected from different municipal school in and around Amalapuram according to the standard procedures (5). Total 208 stool samples were collected between June 2006 to August 2006. All the stool samples were examined by the direct microscopic examination (saline and iodine preparation) and by the formalin-ether concentration methods (5). Analysis of the data was carried out by using Epi info software version 5, 2002 was downloaded from the CDC Website "www.cdc.gov/epiinfo" (6).

4. Results

A total of 208 stool samples were collected. The mean age was 8.8 ± 2.11. 8.8 ± 2.02 for boys and 8.7 ± 2.21 for girls. Important socio-demographic characteristics housing conditions and hygienic habits are shown in the Table 1.

Table 1. Important Socio-demographic Characteristics, Housing Conditions and Hygienic Habits of the Children

Characteristics	No. (%)
Age	
Below 8 years	84 (40.4)
Above 8 years	124 (59.6)
Residence	
Urban	68 (32.7)
Rural	140 (67.3)
Gender	
Male	100 (48.1)
Female	108 (51.9)
Education of mother	
No Education/Primary School	174 (83.7)
Secondary school, high school and more	34 (16.3)
Education of father	
No Education/Primary School	140 (67.3)
Secondary school, high school and more	68 (32.7)
Housing conditions	
Owner	177 (85)
Rental	31 (15)
Municipal tap network	
Yes	64 (30.7)
No	144 (69.3)
Toilets	
Open fields	153 (73.5)
Private/sharing	55 (26.5)
Take bath	
Once a day	141 (69.2)
Washing hands with soap after toilets	
Yes	130 (62.5)
No	78 (37.5)

In all, 133 students (63.94%) were infected with one or more intestinal parasites. 95 (71.4%) of the students were infected with single parasite, 38 (28.6%) with two or more parasites. The most common was *Entamoeba histolytica* (*E.histolytica*) with 41 (30.8%) single and 26 (19.54%) with multiple infections. The second was *Giardia intestinalis* (*G.intestinalis*) with 25 (18.8%) single and 25 (18.8%) with multiple infections. the third one was *Entamoeba coli (E.coli)* with 15 (11.3%) single and 17 (12.78%) with multiple infections. *E.histolytica* and *G.intestinalis* were the most commonly found parasite in multiple infections. 1.5% of Ascaris lumbricoides, 5.3% Hookworm, 0.8% Enterobius vermicularis and 0.8% of Trichuris trichuria were found in the stool sample. The distribution of parasites is shown in the Table 2.

Table 2. The Parasites Distribution in the Study Population

The Parasites distribution in study population	No. (%)
Single	
Entamoeba histolytica	41 (30.8)
Entamoeba coli	15 (11.3)
Giardia intestinalis	25 (18.8)
Hymenolepsis nana	3 (2.3)
Ascaris lumbricoides	2 (1.5)
Hook worm	7 (5.3)
Enterobius vermicularis	1 (0.8)
Trichuris trichiura	1 (0.8)
Total	95 (71.4)
Multiple	

	E. histolytica + *G. intestinalis*	17 (12.8)
	E. coli + *G. intestinalis*	8 (6)
	E. histolytica + *E. coli*	8 (6)
	A. lumbricoides + Hook worm	2 (1.5)
	E. histolytica + Hook worm + A. lumbricoides	1 (0.8)
	T. trichiura + *A. lumbricoides* + *E. vermicularis*	1 (0.8)
	T. trichiura + *E. coli* + Hook worm	1 (0.8)
	Total	38 (28.58)
Grand Total		133 (100)

No statistically significant difference was observed between presence of intestinal parasites and age (P = 0.41), gender (P = 0.48), father education (P = 0.53), toilets (P = 0.3823), housing condition (P = 0.31), municipal tap network (P = 0.43) and daily bath (P = 0.54). The prevalence of intestinal parasitic infection was significantly higher (P = 0.001) in the rural area (70%) than in urban (51.5%). A summary of significant factors observed in the present study population are shown in the Table 3.

Table 3. Significant Risk Factor for Intestinal Parasitic Infection in the Current Study Population

Risk Factors	Overall infection, No. (%)	P value
Residence		0.001
Rural	98 (70)	
Urban	35 (51.5)	
Mother's education		0.004
No Education/Primary School	119 (68.4)	
Secondary school, high school and above	14 (41.2)	
Washing hands with soap after toilets		0.05
Yes	75 (57.69)	
No	58 (74.36)	

5. Discussion

This study found that approximately two-third (63.94%) of the school children was infected with intestinal parasitic infection. In another study performed in India showed a low prevalence (29.2%) of intestinal parasitic infection when compared to the present study (4). The overall prevalence was higher in our study compared to the studies in Turkey (13.8% and 22.4%), Oman (38.7%), and Saudi Arabia (10.94% and (24.4%) Gaza (24.5% and 27.6%), Tehran (18.4%) and in Cambodia (25.7%) (2). In contrast, it was notably high in studies conducted in Thailand (68.1%), Nepal (71.2%) (7, 8). This high prevalence of intestinal parasitic infection may be due to the lack of awareness about personal cleanliness and hygiene and illiteracy among rural population. The prevalence of soil transmitted helminths infections in our study was low when compared to other studies from Izmir and Cambodian (9, 10). Different studies have reported higher prevalence of *A.lumbricoides* (21.7, 20.8, 40.7 and 34.9%), *T.trichiura* (16.3, 15.3, 4.8 and 25.8%) and *Hook worm* (18.5 and 19.1%) (2). Thus, low prevalence of soil transmitted helminths infection should be noted and intervention strategies of the school health could be modified accordingly.

The low prevalence rate of *E.vermicularis* infection in the school children was observed in the present study, compared to the 16-45.3% reported in other studies (1). The incidence may be high because we did not use the cellulose tape test, which is still the best test to diagnose *E.vermicularis* infections. *H.nana* infections (0.8%) was low in our study when compare to the Izmir (10%) Qualyobia (9.9%) and Oman (5.9%) but was higher compared to the studies conducted in Laos (0.2%) (2, 9, 11, 12). In the present we encountered high prevalence of intestinal protozoan parasitic infection when compare to helimenthic infections. *E.histolytica, G.intestinalis* and *E.coli* were the most common intestinal parasitic infection among the study population. These protozoan parasites can be transmitted orally by drinking contaminated water. The water supply is really an important risk factor for protozoan infections several large outbreaks of Giardiasis have resulted from the contamination of municipal water supplies with human waste (13). The ingestion of contaminated water is a common problem in India countrywide due to lower quality of water and faulty sewage lines. The problem is greater in the rural areas that do not have proper municipal water network or sewage system (14).

In this current study the prevalence of intestinal parasitic infection was higher in the rural areas. A similar result was found in Turkey where prevalence of intestinal parasites was higher in the rural areas (1). The prevalence of intestinal parasites was higher in groups where the mother in the household had less than a primary school education similar finding was observed from other study from Turkey (1). No hand wash with soap after toilets was found to be a significant risk factor in the present study group. High prevalence of intestinal parasitic infections in the present may be due to intake of contaminated water, poor hygiene and poor sanitary conditions. Increase access to water and sanitation facilities (through the provision of hand pumps and construction of latrines) in primary schools for students, to promote hygiene practices and improved health among school-aged children and to strengthen the capacity of the Education depart-

ment by improving in-service teacher training (including hygiene-education component). Additional support is targeted at elementary schools to promote personal hygiene awareness and environmental sanitation among primary school children.

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