

# RELATIONSHIP OF INTESTINAL PARASITIC INFECTIONS TO MALNUTRITION AMONG SCHOOLCHILDREN NEAR TEHRAN, IRAN

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**Abstract.** A total of 555 elementary schoolchildren, in Robat Karim District, south of Tehran, were selected by random sampling. General information was collected using questionnaires and face-to-face interviews with the children's mothers. Stool specimens, collected fresh in paper cups, were examined by formalin-ether concentration and direct (wet mount Ringer's solution and merthiolate-iodine-formalin) techniques. The adhesive cellophane tape (Graham) method was used to diagnose oxyuriasis (pinworm infection). All stool examinations were repeated three times on different occasions. The nutritional status of the students was determined based on anthropometrics. Any student whose weight or height was less than -2SD of that expected for a given age was regarded as being malnourished. The prevalence of malnutrition, based on weight-for-age, height-for-age, and weight-for-height was 6.5, 6.5, and 9.6%, respectively. About half (51.4%) of the students had parasites, 24.8% pathogenic, and 26.6% non-pathogenic. 18.5% had giardiasis, 38.9% oxyuriasis, and 4.5% *Hymenolepis nana*. The prevalence of malnutrition among the boys, based on weight-for-height, was higher than for girls. The prevalence of parasite infection in the boys (51.1%) was significantly higher than the girls (42.3%), and a significant relationship was found between malnutrition (height-for-age) and parasitic infection. There was also a significant relationship between malnutrition (weight-for-age) and oxyuriasis.

## INTRODUCTION

Malnutrition and infection are widespread in almost all developing countries. The endemic nature of malnutrition and infection is probably also at the root of additional health problems that impede learning among school-aged children. Parasitic helminths are one of the most common infections in the world. The majority of cases occur in people living in developing countries and is usually common and most intense among school-aged children. Infections in children have been shown to affect their health, growth, nutritional status and cognitive development. School-aged children (5-14 years old) are most likely to have the heaviest infections within a population and therefore be most severely diseased.

Roundworm and whipworm are estimated to infect one quarter of the world's population, and school-aged children have the highest prevalence rates and levels of intensity among those infected (Nokes *et al*, 1992). Roundworm (*Ascaris lumbricoides*) is present in one billion individuals, of whom 400 million are school-aged children. Whipworm (*Trichuris trichiura*) is found in 750 million people, including 300 million children of school age. Hookworm (ancylostomiasis)

infection affects 750 million, of whom 170 million are children. Schistosomes (*Bilharzia*) impair an additional 200 million, including 90 million children (Berkley and Jamison, 1991).

Each of these parasitic infections is associated with a particular set of symptoms. Roundworm usually leads to malnutrition, impaired growth and development as well as abdominal obstruction. Whipworm is associated with growth retardation, chronic colitis, and iron deficiency anemia (Berkley and Jamison, 1991).

A study conducted in Jamaica also found a relationship between whipworm and psychomotor development among children aged three to six (UNESCO, January 1990, B).

Prevalence data, therefore, suggest that programs designed to improve the quality of primary schooling in developing countries must also include efforts to improve the health and nutritional status of students exposed to that schooling. Targeted health and nutrition interventions can confer important educational benefits.

The present study is an attempt to compare parasite prevalence and nutritional status among elementary schoolchildren.

## MATERIALS AND METHODS

A total of 555 students of elementary schools were randomly selected. The students belonged to different

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social categories from Robat Karim District, 40 km south of Tehran. Data were collected using a questionnaire (interviewing mothers). Stool specimens, collected fresh in paper cups, were examined by formalin-ether concentration and direct (wet mount Ringer's solution and merthiolate-iodine-formalin) techniques. The adhesive cellophane tape (Graham) method was used to diagnose oxyuriasis (pinworm infection). All stool examinations were repeated three times, on different occasions.

The nutritional status of the children was assessed by comparing their actual weight and height with that expected for their age, using the scales produced by the NCHS. Any student whose weight or height was less than -2SD of that expected for a given age was regarded as being malnourished.

RESULTS

The main purpose of this study was to determine intestinal parasitic infections in Robat Karim students, as shown in Tables 1 and 5. The prevalence rates of parasitic infection are presented in Table 1. About half (47.1%) of the students had parasitic infections, including 22.8% for pathogenic parasites (*Giardia lamblia* 18.4%, *Hymenolepis nana* 4.4%, and non-pathogenic protozoa (26.4%) (*Entamoeba coli* 19.6%, *Endolimax nana* 3.0%, *Iodamoeba butschlii* 1.4%, *Blastocystis hominis* 0.8%, *Chilomastix mesnili* 0.8%, *Entamoeba hartmanni* 0.6%, and *Dientamoeba fragilis* 0.2%). The prevalence rate of oxyuriasis by cellophane tape was 37.8%. The prevalence rates for malnutrition, based on weight-for-age, height-for-age and weight-for-height, were 6.6, 6.5, and 9.6%, respectively (Table 2).

The difference in the prevalence of parasitic infection was significant between girls and boys (p<0.049) (Table 3). The study showed that the

prevalence of malnutrition among parasite-infected students, based on height-for-age, was higher than among non-infected students (p<0.013) (Table 4). There was a significant statistical correlation between nutritional status for either oxyuriasis students or non-oxyuriasis students (p<0.006) (Table 5).

DISCUSSION

As shown by different investigators, parasitic infections are a major health problem in various parts of Iran (Esfandyare, 1986; Ghorbani, 1990; Yavary, 1990). The types of parasites in various parts of the country depend on climate and soil, and geographic and environmental conditions. In our findings, an overall parasitic infection prevalence of 47.1% was similar to those reported from other areas by other investigators.

The prevalence of Oxyuris and *Giardia lamblia* was higher than other parasites, as reported by different

Table 1  
Parasite prevalence among 495 schoolchildren.

Parasites	Number	Percent
<i>Giardia lamblia</i>	91	18.4
<i>Hymenolepis nana</i>	22	4.4
<i>Oxyuris</i> (Pinworm)	187	37.8
<i>Entamoeba coli</i>	97	19.6
<i>Entamoeba hartmanni</i>	3	0.6
<i>Dientamoeba fragilis</i>	1	0.2
<i>Endolimax nana</i>	15	3.0
<i>Iodamoeba butschlii</i>	7	1.4
<i>Blastocystis hominis</i>	4	0.8
<i>Chilomastix mesnili</i>	4	0.8

Table 2  
Prevalence of malnourished students by sex.

Nutritional status sex	Weight-for-age						Height-for-age						Weight-for-height					
	Girls		Boys		Total		Girls		Boys		Total		Girls		Boys		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
<-2SD	21	6.6	16	6.5	37	6.6	20	6.3	16	6.8	36	6.5	25	8.8	17	11.1	42	9.6
-2SD to 2SD	292	91.8	224	91.8	516	91.8	282	88.7	210	88.7	492	88.6	259	90.9	131	85.6	390	89.0
>2SD	5	1.6	4	1.7	9	1.6	16	5	11	5	27	4.9	1	4	5	3.3	6	1.4
Total examined	318	100	244	100	562	100	318	100	237	100	555	100	285	100	153	100	438	100

p=0.668

p=0.975

p=0.029

Table 3  
Relationship between intestinal parasite infection and sex.

Sex	Positive for parasites		Negative for parasites		Total	
	No	%	No	%	No	%
Boys	137	27.7	131	26.5	268	54.1
Girls	96	19.4	131	26.5	227	45.9
Total	233	47.1	262	53	495	100

p=0.049

Table 4  
Relationship between malnutrition and intestinal-parasite-infected schoolchildren.

Nutritional status	Positive for parasites		Negative for parasites		Total	
	No	%	No	%	No	%
<-2SD	20	8.7	12	4.6	32	6.5
-2SD to 2SD	204	88.7	230	88.1	434	88.4
>2SD	6	2.6	19	7.3	25	5.1
Total	230	100	261	100	491	100

p=0.013

Table 5  
Relationship between malnutrition and oxyuriasis in schoolchildren.

Nutritional status	Positive for Oxyuris		Negative for Oxyuris		Total	
	No	%	No	%	No	%
<-2SD	19	10.2	15	4.9	34	6.9
-2SD to 2SD	168	89.8	283	92.2	451	91.3
>2SD	-	-	9	2.9	9	1.8
Total	187	100	307	100	494	100

p=0.006

studies. The prevalence of these parasites in Caspian areas, Khuzestan Province and Kerman areas, is much higher than for other parts of the country. In general, different studies in Iran showed that with health promotion, provision of safe drinking water, and avoidance of using non-compostable materials, soil-transmitted parasites have been replaced by directly-transmitted parasites, such as pinworm, *Giardia* and *Hymenolepis nana*.

The prevalence rate for malnutrition, based on three indicators-weight-for-age, height-for-age, and

weight-for-height-were 6.6, 6.5, and 9.6%, respectively. Comparison of nutritional status between boys and girls, based on weight-for-age, was significant ( $p<0.029$ ) (Table 2). In Robat Karim, the boys tended to be more undernourished than the girls. The prevalence rate for malnutrition, based on students aged 9-10 years, was higher than other groups, but without significance. The prevalence rate of intestinal parasitic infection in boys (27.7%) was higher than girls (19.3%) ( $p<0.049$ ), as shown in Table 3. Also, the prevalence rate of malnutrition

was higher among boys than girls.

The prevalence rate for undernutrition, based on height-for-age among the students with parasitic infection was higher than the others (Table 4) ( $p < 0.013$ ). In this study, in contrast to the Kerman and Sirjan investigators (Esfandyary, 1986), there were significant differences between parasite-infected students and parasite-uninfected students. In other countries, such as Thailand (Egger *et al*, 1990), Tanzania (Tanner *et al*, 1987), and Peru (Sarabia-Arce *et al*, 1990) have shown that intestinal parasitic infection causes stunting and wasting in among school-aged children.

This study shows that the prevalence of malnutrition among the students infected by pinworm was higher than for other infections ( $p < 0.006$ ).

Vast numbers of school-aged children in developing countries face major health and nutrition problems that adversely affect their ability to take advantage of the limited educational opportunities available to them.

Many of these children have a history of PEM as well as current nutritional deficiencies, including deficits in body stores of iodine, vitamin A, and iron. These conditions are exacerbated by helminth infections, which are highly prevalent among school-aged children and particularly inimical to their healthy growth, development, and educational progress.

Temporary hunger and sensory impairment are also widely prevalent conditions (despite the fact that the exact numbers are unknown), which vitiate attempts made by children and their families to reap the benefits of classroom instruction.

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