

## The Relationship between Malnutrition and Intestinal Parasitic Infections among Preschool Children in East Area of Iran

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### Abstract

#### Background

Malnutrition and infections are widespread in almost all developing countries. The aim of this study was to investigate prevalence and some of the determinants of malnutrition and intestinal parasitic infections among preschool children in Shahrood, Iran.

#### Materials and Methods

At a cross-sectional study, the all preschool children (1,850 cases), in Shahrood city as simple census, were selected. General information was collected using questionnaires and face-to-face interviews with the children's parent. Stool specimens, collected fresh in paper cups, were examined by formalin-ether concentration. Also, the adhesive cellophane tape method was used to diagnose oxyuriasis. The nutritional status of the children's was determined based on anthropometrics. Data were analyzed using the SPSS.

#### Results

The prevalence of malnutrition, based on weight-for-age, height-for-age, and weight-for-height was 6.7, 5.8 and 7.7%, respectively. A third of children (35.1%) had parasites infections, including 22.8% pathogenic parasites and 26.4% non-pathogenic and 35.5% of children were infected to oxyuris. The prevalence of parasite infection in the boys (51.1%) was significantly higher than the girls (42.3%). Also, a significant relationship was found between malnutrition (height-for-age) and parasitic infections ( $P < 0.05$ ).

#### Conclusion

The results of this study showed that about a third of children' kindergarten of Shahrood infected to at least one intestinal parasitic infection and these infections can cause malnutrition in children's preschool.

**Key Words:** Children, Intestinal parasite, Iran, Malnutrition.

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## 1- 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 preschool-aged children (1-2). Parasitic helminths are one of the most common infections in the world. The majority of these cases occurring in people living in developing countries and is usually common and most intense among preschool-aged children (3). Infections in children have been shown to affect their health, growth, nutritional status and cognitive development (4-6). Preschool-aged children (3-6 years old) are most likely to have the heaviest infections within a population and therefore be most severely diseased (7).

Roundworm and whipworm are estimated to infect one quarter of the world's population, and preschool-aged children have the highest prevalence rates and levels of intensity among those infected (8). 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 (9).

*Giardia lamblia* is the most common intestinal parasite in the United States especially among school children (10). 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 (11). A study conducted in Jamaica, found a significant relationship between whipworm and psychomotor development among children aged three to six. 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 children exposed to that schooling(12).

Intestinal parasitic infections are historically common in Iran. Although epidemiologic characteristics of these infections have been studied in some populations (mostly children) in Iran, a true and accurate picture of the magnitude of the problem is still unclear and the challenge still remains (these studies are mainly available in the Persian literature) (13). Targeted health and nutrition interventions can confer important educational benefits (14). The present study aimed to compare parasite prevalence and nutritional status among preschool children, in Shahroud city, Iran.

## 2- MATERIALS AND METHODS

### 2-1. Study design and population

This investigation was a cross-sectional study, which performed on 28 kindergarten children (1,850 children) of the Shahroud city (North East of Iran) in the 2014 for census were selected.

### 2-2 The inclusion criteria

Children 4 to 6 years, parental consent to participate in research and proper cooperation, children without chronic diseases and no specific drug consumption. Of total 2000 children who were in kindergarten children, 1850 children had the inclusion criteria.

### 2-3. Measuring tools

Data were collected by: 1) a demographic characteristics form included age, gender, economic status, Body mass index (BMI) status, etc. by enforcement authorities and cooperation with kindergarten, face-to-face interviews with the children's parent were collected and 2) a standard questionnaire for assessment of National Center for Health Statistics (NCHS) Reference (15). The questionnaire was structured based on the international literatures and in addition to standard test, parasitic infections studied. Malnutrition is a disorder that results from the interaction between diet and infection. It commonly affects all age groups in a community, but infants and children are the most susceptible because of their high nutritional needs for physical growth and development (16). Indicators of malnutrition include wasting, stunting and underweight, which represent different aspects or measurements of malnutrition. The level of under nutrition was assessed using standard deviation (SD) classification based on weight-for-age (underweight) height-for-age (stunting) and weight-for-height (wasting). The children whose weight for age, height for age and weight for height were less than one standard deviations (SD) below the median and higher than -1SD, are classified as mildly underweight, mildly stunted or mildly wasted, respectively, according to NCHS Reference (15).

Moreover, children whose weight for age, height for age and weight for height were less than two standard deviations (SD) below 2SD median and higher than -1SD, are classified as normal, according to NCHS Reference . Furthermore, children whose weight for age, height for age and weight for height were less than two standard deviations (SD) higher than 2SD median are classified as high, according to NCHS Reference (15-16).

### 2-3. Methods

In this study for each child was given to parents container collect stool and samples after collection, were transported to the Shahroud University of Medical Sciences central lab. In separate meetings at the Shahroud city nursery to parents were taught correctly to sample tape with the adhesive paste in the anous area children and then transfer the glue on laboratory slides were prepared and to depositing to lab. Scotch tape taking samples was done during the first and second quarters of 2014 by the parents.

Stool tests in the central laboratory of the Shahroud University of Medical Sciences, with help responsive parasite experts, 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.

To measure for height and weight of each subject, was measured following standard procedures, using digital weighing scale and anthropometric rod to the nearest 0.1 kg and 0.1 cm, respectively. Children whose weight for age, height for age and weight for height were less than two standard deviations (SD) below the median are classified as underweight, children or wasted, respectively (15). The various parasitic infections in the target group were compared individually assessed to determine if contamination is more dominant.

### 2-4. Data analyses

Descriptive statistics [mean, standard deviation (SD), frequency] and Chi-square test were used for analysis in this study. Data were analyzed using the Statistical Package for the Social Science (SPSS version 16). The P-value less than 0.05 were considered significant.

### 3- RESULTS

The main purpose of this study was to determine intestinal parasitic infections and malnutrition among children of Shahroud city nurseries. A total of 1850 kindergarten children participated in this survey, including 955 (51.6%) boys and 895 (48.4%) girls, 1000 cases (54.1%) were from urban and 850 cases (45.9%) were from rural areas. The mean age of the participants was  $5.4 \pm 1.1$  years (95% CI: 6.1, 4.3). Almost 35.1% (649) children were infected with one or more intestinal parasites. The prevalence rates of parasitic infection are presented in (Table.1).

About 35.1% of the children 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%, Blastocystishominis: 0.8%, Chilomastixmesnili: 0.8%, Entamoeba

Hartmanni: 0.6 %, and Dientamoeba Fragilis: 0.2%]. Results showed that the prevalence rate of Oxyuriasis by cellophane tape was 35.5%. The prevalence rates of malnutrition, based on weight-for-age, height-for-age and weight-for-height, were 6.7, 5.8 and 7.7%, respectively. The prevalence rates of malnutrition are presented in (Tables.2-4).

Results showed that the difference in the prevalence of parasitic infection was not significant between girls and boys (Table.5). The study showed that the prevalence of malnutrition among parasite-infected children, based on height-for-age, was higher than among non-infected children ( $P=0.02$ ), that these findings are shown in (Table.6).

There was a significant statistical relationship between nutritional status for either oxyuriasis children or healthy children ( $P=0.001$ ) that these findings are shown in (Table.7).

**Table 1:** Parasite prevalence among 649/1850 preschool children

Parasite	Number	Percent (%)
Giardia Lamblia	128	19.7
Hymenolepis Nana	20	3.1
Oxyuris	230	35.5
Entamoeba Coli	112	17.3
EntamoebaHartmanni	3	0.5
DientamoebaFragilis	1	0.1
Endolimax Nana	23	3.6
IodamoebaButschili	11	1.7
BlastocystisHomonis	3	0.5
ChilomastixMesnili	3	0.5
Total	649	100

**Table 2:** Prevalence of malnutrition in preschool children

Nutritional Status	Weight-For-Age						
	Gender	Girls		Boys		Total	
	Frequency	N	%	N	%	N	%
< -2SD		56	6.3	68	7.1	124	6.7
-2SD to 2SD		820	91.6	870	91.1	1690	91.4
>2SD		19	2.1	17	1.8	36	1.9
Total		895	48.4	955	51.6	1850	100
P-value		0.003					

**Table 3:** Prevalence of malnutrition in preschool children

Nutritional Status	Height-For-Age					
	Gender	Girls		Boys		Total
Frequency	N	%	N	%	N	%
< 2SD	47	5.3	60	6.3	107	5.8
-2SD to 2SD	831	92.8	877	91.8	1708	92.3
>2SD	17	1.9	18	1.8	35	1.9
Total	895	48.4	955	51.6	1850	100
P-value	0.04					

**Table 4:** Prevalence of malnutrition in preschool children

Nutritional Status	Weight-For-Height					
	Gender	Girls		Boys		Total
Frequency	N	%	N	%	N	%
<-2SD	67	7.5	66	6.9	143	7.7
-2SD to 2SD	808	90.3	869	90.1	1677	90.6
>2SD	20	2.2	20	3.0	40	1.7
Total	895	48.4	955	51.6	1850	100
P-value	0.02					

**Table 5:** Relationship between intestinal parasite infection and gender

Gender	Positive for parasite		Negative for Parasite		Total		P-value
	Number	%	Number	%	Number	%	
Boys	331	17.9	624	33.7	955	51.6	0.245
Girls	318	17.2	577	31.2	895	48.4	
Total	649	35.1	1201	64.9	1850	100	

**Table 6:** Relationship between malnutrition and intestinal parasite infection in preschool children

Nutrition status	Positive for parasite		Negative for Parasite		Total		P-value
	Number	%	Number	%	Number	%	
< -2SD	87	13.4	68	5.7	155	8.4	0.02
-2SD to 2SD	537	82.7	1063	88.5	1600	86.5	
> 2SD	25	3.9	70	5.8	95	5.1	
Total	649	100	1201	100	1850	100	

**Table 7:** Relationship between malnutrition and intestinal parasite infection in preschool children

Nutrition status	Positive oxyuris		Negative oxyuris		Total		P-value
	Number	%	Number	%	Number	%	
<-2SD	69	30	86	5.3	155	8.4	0.001
-2SD to 2SD	124	53.9	1476	91.1	1600	86.5	
>2SD	37	16.1	58	3.6	95	35.5	
Total	230	100	1620	100	1850	100	

#### 4- DISCUSSION

The prevalence and epidemiologic features of intestinal parasites vary in different parts of the world. For instance, the prevalence of *Entamoeba Histolytica* ranges from 5% to 81% and was suggested infecting approximately 480 million people globally. *Giardia lamblia* was reported as the most common intestinal parasite in the United States. Due to parasitic infections are major health problem in various parts of Iran. The types of parasites in various parts of the country depend on climate and soil, and geographic and environmental conditions (1-3).

In this study, we found prevalence of intestinal parasites to be 35.1% among preschool children in Shahroud in North Ears of Iran that was similar to those reported from other areas by other investigators (2). The prevalence of parasitic infection in both gender and rural children and urban children was the same that this finding similar to Shafieian and Duwarah results (3-4).

The prevalence of Oxyuriasis and *Giardia lamblia* was higher than other parasites, as reported by different studies (5). The prevalence of these parasites in Caspian areas, Khuzestan Province and Kerman areas was higher than the 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, soiltransmitted parasites have been replaced by directlytransmitted parasites, such as pinworm, *Giardia* and *Hymenolepis nana* (5-4). The prevalence rate of malnutrition, based on three indicators: weight-for-age, height-for-age, and weight-for-height were 6.7; 5.8 and 7.7 %, respectively.

Comparison of nutritional status between boys and girls, based on weight-for-age, was significant ( $P<0.05$ ). In Shahroud city, the boys tended to be more undernourished

than the girls. The prevalence rate for malnutrition, based on students aged 3-4 years, was higher than other groups, but without significance. Also, the prevalence rate of intestinal parasitic infection in boys was higher than the girls ( $P<0.05$ ). The prevalence rate of malnutrition was higher among boys than girls that this finding similar to Esfandyare and Ghorbani results and with research findings Nokes was conflict (9-11). The prevalence rate for undernutrition, based on height-for-age among the students with parasitic infection was higher than the others ( $P<0.05$ ) (12).

In this study, in contrast to the Kerman and Sirjan investigators, there was a significant relationship between parasite-infected children and parasite-uninfected students. In other countries, such as Thailand, Tanzania, and Peru have shown that intestinal parasitic infection causes stunting and wasting in among school aged children (13-15). The current study showed that the prevalence of malnutrition among the students infected by pinworm was higher than for other infections ( $P<0.05$ ). Vast numbers of preschool-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 (16).

Many of these children have a history of Protein-energy malnutrition (PEM) as well as current nutritional deficiencies, including deficits in body stores of iodine, vitamin- A, and iron. These conditions are exacerbated by helminthes infections, which are highly prevalent among preschool-aged children and particularly inimical to their healthy growth, development, and educational progress (17-18).

#### 5- CONCLUSION

The prevalence rates of malnutrition, based on weight-for-age, height-for-age

and weight-for-height, were 6.7, 5.8 and 7.7%, respectively. Almost 35.1% (649) children were infected with one or more intestinal parasites. Results showed that the prevalence rate of Oxyuriasis by cellophane tape was 35.5%. The present study provides a recent and accurate picture of the prevalence of Intestinal Parasitic Infections and malnutrition in preschool- age children in Shahroud city. This information can be used by the health authorities in the area to target appropriate health and education interventions, as a minimum, to pregnant women, new mothers and infants. Therefore, this study support the need for urgent family-based prevention programs that are focused on guiding parents to care intestinal parasite infections and foster correct child feeding patterns as well as to promote child's healthy food intake in Shahroud.

**7-CONFLICT OF INTEREST:** None.

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