

# A Comparative Study between Malnourished and Well-nourished Diarrheal Children Suspected with Giardiasis

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**Abstract---** The present study was carried out during the period of January to June 2018 in Al-Hilla Province. The study included 100 samples which were collected from diarrheal pediatric patients at ages ranged between 1-6 years old; 50 sample were taken from malnourished-children (30 male, 20 female) and 50 samples were taken from well-nourished diarrheal children . The study patients were being submitted to the Maternity and Children and Al Nour Hospitals in Al-Hilla City. Study pediatric children and their samples were examined clinically and microscopically , clinically by the aid of the specialist physician and patients guider with the hospital record , and microscopically in the parasites laboratory of the hospitals.

The present study revealed that the males were infected more than females with giardiasis (58.3%) and (41.6%), respectively. The Giardiasis was occurred in a high percentage in the age group ranged from 5 to 6 years old(50%). It was more occurrence in the rural areas than those in urban areas which was (66.6%) and (33.3%) , respectively. The study obtained results revealed that the type of diarrheal symptoms among Giardiasis infected children were varied from watery 7(58.3), fatty 2(16.6), bloody 1(8.3), mucus1(8.3) and mixed 1(8.3), respectively.

Furthermore, there were different percentages of Giardia infection among study pediatric individuals according to their feeding patterns. The breast feeding, under two years old children was 33.3%, followed by artificial feeding (33.3%) and mixed feeding(16.6%), respectively. Whereas, in a multinutrition patterns children (2-6 years old) was 16.6%.

In addition, there were a different percentages of Giardiasis co-infection 8 cases (66.7%), whereas the solely infection of Giardia was 4 cases (33.3%).

**Keywords---** Giardiasis, Malnourishment, Well-nourishment, Diarrhea, Co-infection, Solely Infection, Demographically, Clinically.

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## I. INTRODUCTION

The intestinal protozoan *Giardia duodenalis* (synonym of *Giardia intestinalis*) is a cosmopolitan parasite frequently found in diarrhoeal disease throughout the world (1). It is one of the most common causes of food and waterborne disease outbreaks associated with drinking water (2,3).The prevalence of giardiasis is 2 to 5% in developed countries and 20 to 30% in developing countries ,respectively (4). The high prevalence in these countries has been suggested to be associated with long-term growth retardation in children (5).

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Numerous factors can talk about infection by giardiasis , one main factor of these is malnutrition(15,16).The malnutrition defined as underweight, is a serious public-health problem that has been linked to a substantial increase in the risk of mortality and morbidity. Women and young children bear the brunt of the disease burden associated with malnutrition. Many factors can cause malnutrition, most of which relate to poor diet or severe and repeated infections, particularly in underprivileged populations. Inadequate diet and disease, in turn, are closely linked to the general standard of living, the environmental conditions, and whether a population is able to meet its basic needs such as food, housing and health care(17).

The pathogenesis mediated by Giardiasis is not clearly understood, and its symptoms, included acute or chronic diarrhea, dehydration and abdominal pain, are highly variable (3,7), and may even not be evident in a significant proportion of infected patients (8). In children less than five years old, The infection of Giardia may produce severe acute diarrhea. On the other hand, chronic infection may result in weight loss and growth retardation(9).

The diagnosis is initially based on clinical signs and symptoms and confirmed by the presence of cysts and trophozoites in stool samples. There is no gold standard for the diagnosis of giardiasis (12). Historically, trophozoites or cysts of *G. duodenalis* were detected in stool samples by microscopic examination (direct examination). A definitive diagnosis may require repeated stool examinations, stool immunoassays, or even sampling of the upper intestinal contents (14).

In a substantial proportion of patient with infectious diarrhea reported from developing countries, more than one enteric pathogen may be recovered, the *Helicobacter pylori*, *Entamoeba histolytica* and *Cryptosporidium* and fungi are microorganisms that grow in duodenum and stomach (19), and it's the most important diarrhea-causing parasitic protozoa for many years with often similar clinical presentations (20). So that, the present study aimed to study of Giardiasis among a diarrheal symptomized malnourished and well- nourished children and hygienic habits among Hilla pediatric population.

## **II. MATERIALS AND METHODS**

### **3.1 Materials**

#### **3.1.1 Study Population**

The present study was carried out in Hilla City for the period of January until June 2018. The study included 100 individuals: 50 were malnourished diarrheal children and 50 of well-nourished diarrheal children. The study was carried out in: Hilla hospital of maternity and children, and Al Nour hospital. The study pediatric patients included both sexes of different ages.

#### **3.1.2 Equipments and Apparatus**

The present study was accomplished inside the parasite laboratory in all study targeted hospitals by use the available equipments and apparatus for intended purposes.

### 3.2 Methods

#### 3.2.1 Study Design

Group-I: Stool samples were collected from diarrheal malnourished Giardiasis-suspected children.

Group-II: Stool samples were collected from diarrheal well-nourished Giardiasis-free children.

#### 3.2.2 Data Collection

A questionnaire paper was done for each diarrheal suspected patient in the study which include: (demographical, clinical sign and symptoms and hospitalization stay).

Table 1: Questionnaire Paper that Concerns each suspected Giardiasis Infested Children

<i>Patients Criteria</i>	<i>Data</i>
<b>Demographically</b>	-Age -Sex -Residence -Educational level -Socioeconomic level
<b>Clinically</b>	((Clinical signs and symptoms)) -Through physician consultation -Through hospital record -Through patient guider
<b>Gross examination</b>	-Stool examination macroscopically -Body weight - Type of feeding

A pretested questionnaire paper was used to collect information on the demographic (e.g. age, sex and number of household members), socioeconomic (e.g. household monthly income, occupation and educational status), environmental (e.g. availability and types of toilets in the household, types of water supply, garbage disposal and presence of domestic animals), personal hygiene (e.g. washing hands before eating, after defecation and after playing with animals, washing vegetables and fruits before consumption, boiling water before consumption and bathing place), and general health status of the participants (i.e. symptoms related to intestinal parasitic infections such as diarrhoea, nausea, vomiting, abdominal pain and a history of receiving anthelmintics treatment). The participants were regarded as symptomatic if they presented with any one of the signs and symptoms mentioned above in the past one week.

#### 3.2.3 Sample Collection

The stool specimen was taken by a plastic container from each patient. All stool samples were examined by direct method under microscope for detection of *giardia lamblia* by taking a small portion of stool and put normal saline on slide and then put the cover slips after mixing both and examined under microscopic field.

#### 3.2.4 Participation of Study Examination

##### 3.2.4.1 Part-I: Clinically

- By use a questionnaire papers.
- Patient's hospital records.
- Consultation of patient's specialist physician and guiders.

### 3.2.4.2 Part-II: Demographically

All studied data of patients were itemize in specialized questionnaire paper.

### 3.2.4.3 Part-III: Laboratory

#### 3.2.4.3.1-Parasitology

Direct microscopic examination of stool sample from Giardia patients.

- Identification of *G. lamblia* according to morphological properties through wet amount test.
- Detection of most important risk factors that bring about prevalent of Giardiasis.

#### 3.2.4.3.1.1. Direct Microscopic Examination of Stool

1. Apply the patient's sample to a small area on a clean microscope slide. Remove any gross fibers and particles.
2. Immediately before the specimen dries, add 1 or 2 drops of saline with a pipette.
3. Cover the specimen with a cover slip. (Note: Avoid air bubbles by drawing one edge of the coverslip slightly into the suspension and lowering it almost to the slide before letting it fall. The amount should be just thick enough that newspaper print can be read through the slide.)
4. If desired the coverslip (s) can be sealed using petroleum jelly and Paraffin oil or other suitable sealing preparations. Sealing the coverslip keeps organisms from moving when using oil immersion objectives and prevents the preparation from drying out.

#### Examination

1. Examine the specimen with the low power objective (10x) and low light. Begin at one corner of the smear and systematically examine successive adjacent swaths with the low power microscope. Low power examination includes entire area of 22 by 22 mm coverslip preparation (both saline and iodine).
2. When a parasite like object comes into view, it should be more closely examined and identified under high power (40x) objective. High dry power examination should include at least one third of the coverslip area (both saline and iodine).

## III. RESULTS AND DISCUSSIONS

A total of 100 samples were taken from children. Precisely, 50 specimens were taken from malnourished Giardiasis-suspected children, of which only 10 (20%) of infected children with Giardiasis, and 50 specimens were used from well-nourished Giardiasis-free children of these only 2 (4%) were infected with Giardiasis.

Table 1: The Percentage Value of Giardiasis-Infected Children among all Study Tested Number

Total number of specimens	number of malnourished children	Infected children	%	Number of well-nourished children	Infected children	%
100	50	10	20	50	2	4
Sum	12%					

Since *Giardia lamblia* parasite is a cosmopolitan parasite and frequently be found in the most of diarrhoeal diseases throughout the world and it is one of the most common causes of waterborne disease outbreaks associated

with drinking water (1, 3). Hence and accordingly with the study obtained results, the high prevalence in these studies has been suggested to be associated with long-term growth retardation in children (5,6).

A previous longitudinal studies have been permitted a visualization of the changes in weight, height and growth over time, which are better indicators of malnutrition patterns (5,6). Whereas, the present findings do not provide evidence that Giardiasis is the causal factor of weight loss among the children in this study.

However, it is very probable that infection is one of several factors associated with low nutritional status, together with sanitary and socioeconomic conditions (8,9). These findings are of great importance and should be considered when designing health education programs or interventions to target childhood linear growth failure in complementary nutrition programs for children (10,11).

In this study, the detection of giardiasis infected children according to age groups was shown in table-2. It was appeared that the higher number of giardiasis infected children in age group 5-6 years is (50%), while in the patients from 1-2 and 3-4 years is (25%) for each age group, respectively.

Table 2: Assortment of Giardiasis-infected Children According to their Age Group

Age group	Tested number	Infected number	%
1-2 year	25	3	25
3-4 year	25	3	25
5-6 year	50	6	50
Total No	100	12	100

In the present study, the occurrence of giardiasis was varied among studied patients ages., it was observed that 5-6 years group was mostly infected with giardiasis, and this was closely followed by 3-4 years age group. This may be explained by the increasing activity of these children, being at school and playgrounds more than younger children, and also, lacking the personal hygiene than older children. This finding is in accordance with previous studies (Naglaa *et al*, 2011).

Also, this study goes with Jorge *et al.*, (2009) in which the prevalence of Giardiasis according to age group was not statistically significant, a slightly higher prevalence was observed among children aged five to six years-old than among >4 years-old and < 6 years-old. This could indicate that infection transmission occurs during intermediate childhood, perhaps when children normally play in very close contact (7).

Table 3: Assortment of Giardiasis among Malnourishment Children According to their Demographical Criteria

Number of malnourished Children (50)	Demographical criteria		Tested number	Infected number	%
	Age group	1-2 years	12	3	30
		3-4years	13	3	30
		5-6yeaes	25	4	40
	Gender	male	30	6	60
		female	20	4	40
	Residence	Rural	27	7	70
		Urban	23	3	30
Sum			50	10	20

The ability to determine the true nutritional status of the population is limited by the use of a cross-sectional study design. A longitudinal study would permit visualization of the changes in weight, height and growth over time, which are better indicators of malnutrition patterns (3).

The present findings do not provide evidence that Giardiasis is the causal factor of weight loss among the children in this study. However, it is very probable that infection is one of several factors associated with low nutritional status, together with sanitary and socioeconomic conditions (7),

Addressing these sociodemographic factors are a means of preventing future growth impairment, as well as the impairment of the physical and mental development in children, and will assist in alleviating malnutrition and improving the quality of health of children at risk(9,10).

This may be explained by the increasing activity of these children, being at school and playgrounds more than younger children, and also, lacking the personal hygiene than older children. This finding is in accordance with previous studies that reported that the highest risk was seen in the young children, with a decreasing risk in older children and adults (Naglaa *et al*, 2011).

Although, the study result was in agreement with a study of a rural community in Malaysia, which reported higher association among 2-6 year-old children (AL-Mekhiafi *et al.*, 2005).

Table 4: Assortment of Giardiasis Infected Children According to their Type of Diarrhea

<i>Giardiasis infected number</i>			<i>Type of diarrhea</i>							
12	<i>Watery</i>		<i>Bloody</i>		<i>Fatty</i>		<i>Mucus</i>		<i>Mixed</i>	
	No.	%	No.	%	No.	%	No.	%	No.	%
	7	58.3	1	8.3	2	16.6	1	8.3	1	8.3

The presentation of the type of diarrhea among giardiasis infected children was shown in table-4 . After macroscopically examination of stool patients samples (color, consistency, odor), it was found that the type of watery diarrhea (58.3%), while bloody diarrhea (8.3%) , and fatty diarrhea about(16.6%) , mucus diarrhea about (8.3%), and finally mixed diarrhea about(8.3%) , respectively.

The explanation for such obtained results may be related to the type of infection, duration of infection, developmental case of disease(acute or chronic), severity of presented disease, patients immunological level. Globally, there are many and various studies were obtained and explained such results (7,9,19).

The assortment of Giardiasis-infected children according to their type of nutrition was shown in the table-5. It was appeared that the babies of breast feeding under 2 years and Babies of artificial feeding under 2 years were (33.3%) for each type ,while Babies with mixed feeding under 2 years and Multi nutrition from 2-6 years were about (16.6%) for each type , respectively.

Table 5: Assortment of Giardiasis-Infected Children According to their Type of Nutrition

<i>Giardiasis-infected children</i>	<i>Type of nutrition</i>							
	<i>Breast feeding (&gt;2years)</i>	<i>%</i>	<i>Artificial feeding (&gt;2 years)</i>	<i>%</i>	<i>mixed feeding (&gt;2 years)</i>	<i>%</i>	<i>Multinutrition 2-6 years</i>	<i>%</i>
12	4	33.3	4	33.3	2	16.6	2	16.6

In a well view, the present study has found a lower prevalence of Giardiasis in 1 to 2 years old group and it may be explained by the fact that the community has a culture of prolonged breast feeding of children: protective effect against giardiasis thanks to exclusive breastfeeding was demonstrated compared with no breast-feeding among infants. A hospital based surveillance study reported that breast-feeding was protective against *Giardia lamblia* infections for infants up to 6 months of age (Naglaa *et al*; 2011).

This protection, however, may be independent of the role of mother's milk protective antibodies. An *in vitro* study has shown that certain components of nonimmune milk are capable of destroying *Giardia* trophozoites (Naglaa *et al*; 2011).

This finding further strengthens our current knowledge and is in disagreement with an earlier study, which reported that breast-feeding was not effective once an infection was established. In addition, by exclusively breast-feeding, there is a potential to significantly decrease the frequency and severity of giardiasis infection, presumably through the reduced exposure to contaminated infant foods, drinking water, and feeding utensils (?).

The protective mechanism of breast-feeding is a complex that varies by pathogen and by the age of the infants and children. An *in vitro* study has shown that certain components of nonimmune milk are capable of destroying *Giardia* trophozoites. This finding was produced earlier by Gillin and colleagues (year), who demonstrated an unusual lipase in breast milk that possessed giardiacidal activity, independent of secretory immunoglobulin A, that rapidly destroyed this parasite on exposure to normal human milk *in vitro* (?).

Table 6: Assortment of Giardiasis-Infected Children According to the Type of Infection

Giardiasis infected number	%	Type of infection					
		Co-infection	Number	%	Solely infection	Number	%
12	12	<i>Giardia lamblia</i> + <i>Entamoeba histolytica</i>	3	25	Giardiasis	4	33.3
		<i>Giardia lamblia</i> + <i>Ascaris lumbricoides</i>	2	16.7			
		<i>Giardia lamblia</i> + <i>Enterobius vermicularis</i>	2	16.7			
		<i>Giardia lamblia</i> + <i>Hymenolepis nana</i>	1	8.3			
Sum			8	66.7		4	33.3

The type of infection among the study giardiasis-infected children has been shown in table-6, and it was noticed that the *Entamoeba histolytica* was 3(25), both *Ascaris lumbricoides* and *Enterobius vermicularis* were 2 (16.7) in each case of co-infection, and *Hymenolepis nana* was 1(8.3%). The overall Giardiasis co-infection was 8 (66.7) while the Giardiasis- solely infections was 4 (33.35), respectively.

Indeed, the humans gastrointestinal tract represent the portal entrance for a lot of foreign bodies and particles to inside its lumen, and accordingly the Giardiasis co-infection with some other pathogenic agents has been previously reported among world healthy and unhealthy children, in a population with high levels of helminthic infection and other microbes (32), suggesting that this condition increases the susceptibility to infection with other microbes (34). Other researchers suggest that any other gastric infection may induce a chronic gastritis and increase the susceptibility to *G. lamblia* infection (32).

The study obtained results revealed that a higher percentage of *G. lamblia*/helminth co-infections than would be expected by random assortment, but the analyses suggest that these results may be related to applied treatment with albendazole or mebendazole that may increase the odds of giardia infection, (Rousham *et al*; 1994) the analyses suggest that this is not a direct effect of the drug administered, but that the removal of helminths increases giardia susceptibility (Aaron *et al*; 2013).

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