



Giardiasis infection prevalence and related risk factors in Children of Babil: An epidemiological investigation

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Abstract

The study was conducted during the period from the beginning of October 2024 to March 2025. Patient samples were collected from children aged 1–12 years from the Educational Children's and Maternity Hospital, Al-Noor Children's Hospital in the governorate center, and some private laboratories in Babil Governorate. Stool samples were examined using several methods, including direct wet swab, sedimentation methods, and flotation methods staining and to detect the trophozoites, cyst and Oocyst phases of these parasites to evaluate the relationship of some factors (gender, age ,educational and area) to the 145 samples examined, 88(25.5%) were surprisingly positive for *Giardia lamblia*. The prevalence rate among males 56 (63.6%) (%) was higher than females32 (36.3%). Based on the results of this study, it is concluded that the prevalence of *G. lamblia* in Babil Governorate remains high, and effective technologies and plans are required to prevent the spread of these parasites. Distribution by residential area shows that children living in rural areas have a slightly higher infection rate children living in urban areas had higher infection rate 21 (23.8%) compared to those in rural areas 67 (76.1 %). Urban overcrowding and limited access to clean water in some neighborhoods may contribute to this trend. Distribution of infected cases by age group within each gender. The highest infection rate was found in the 11-12 age group, reaching 36 (40.9%) while the lowest infection rate was found in < 2 years age group, reaching 3 (3.4%) where of infected cases by age group within each gender highest . The results indicated that the highest prevalence among males was observed in the 8-10 year age group, at 50%, while the lowest prevalence was recorded among children aged 2-4 years, with only two cases (3.5%). The highest incidence among females was recorded in the 5-7 year age group, with 17 cases (30.3%), while no cases were recorded among children under 2 years of age (0.0%). The study also showed that children whose fathers were uneducated were more likely to contract giardiasis than those whose fathers were educated, at 58.3% and 41.7%, respectively. A similar trend was observed with regard to the mothers' education level, with the prevalence of infection being higher among children of uneducated mothers compared to children of educated mothers, at 20.4% and 79.5%, respectively.

Keywords: Giardiasis; Diarrhea; Risk Factors; Parasite; Infection

1. Introduction

Diarrhea is a highly widespread condition that can result in death owing to dehydration caused by fluid loss [1]. the primary contributors to diarrhea. Among the significant intestinal parasites, *Giardia lamblia* is prevalent globally and is often located in warm, humid environments. Intestinal parasite infections are prevalent in underdeveloped nations due to unsanitary surroundings, substandard living environments, overcrowding, insufficient sewage systems, and neglect of personal health. [1]. Viruses, and bacteria, [2].

The most common protozoon to invade the human small intestine, particularly in infants, is *Giardia lamblia*, also known as *Giardia duodenalis* or *Giardia intestinalis*. It causes over 280 million infections every year and poses little damage to human health. [3]. The prevalence of *Giardia lamblia* infection ranges from 2% to 5% in industrialized countries,

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whereas it may reach 20% to 30% in developing countries. Higher infection rates are commonly observed among children younger than five years of age, particularly in those suffering from malnutrition [4, 5]. *Giardia lamblia* infection in humans occurs in two stages: the trophozoite stage and the cyst stage. The trophozoites adhere to the mucous membrane of the small intestine, leading to the appearance of clinical symptoms in infected individuals. Ingesting food and drink contaminated with the developing cysts leads to infection. After the cyst is ingested, the trophozoites are released during the cyst's release process in the duodenum of the small intestine [6].

Common clinical symptoms of *G. lamblia* include lethargy, abdominal pain, flatulence, increased flatulence, and paleness. Patients also exhibit decreased intestinal enzyme activity and malabsorption of fats, lactose, vitamin A, and vitamin B12 [7]. Diagnosis is based on clinical symptoms and confirmed by identifying cysts and trophozoites in stool samples using direct microscopy. Enzyme-linked immunosorbent assay (ELISA) can be used to detect *G. lamblia* antigens in stool samples[8].

The parasite's cysts can be transmitted by consuming food or water contaminated with feces, or through direct contact with infected sources[9]. The zoonotic transmission of *G. lamblia* has been a controversial topic for decades. Some studies have provided evidence supporting transmission from dogs to humans, whereas other investigations have suggested only limited zoonotic potential. Recently, a review on the zoonotic potential of *G. lamblia* concluded that current evidence does not recommend a significant risk of ZT to humans. [10]. Determine the prevalence of Giardiasis infection among children in Babil. distribution the Investigate of Giardiasis in Babylon province according to age, gender, and home location. Assess probable risk factors contributing to infection.

2. Material and Methods

2.1. Design of Present Study

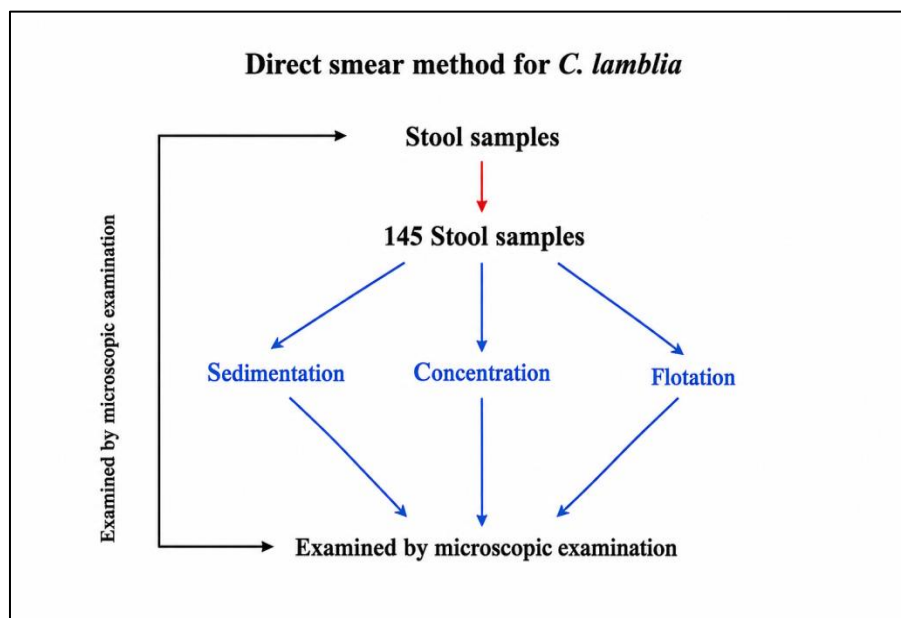


Figure 1 Study design

2.2. Samples collection

Stool samples collected from patient infected diarrhea different ages and sex of Babylon Stool samples were collected directly from the patients, samples were collected in clean tightly lidded plastic container and given a serial number. Samples were collected with the appropriate precautions and use of disposable gloves. The specimens were then subsequently delivered to the laboratory under cool temperature and examined microscopically in the parasitology lab. The study involved collecting 145 stool samples from children suffering from diarrhea and other intestinal disorders who came to a hospital and some private laboratories in Babil Governorate. Their ages ranged from one to 12 years. The personal information was recorded according to a form prepared for this purpose, which included gender, age, date of visit, area of residence, and infection with intestinal parasites.

2.3. Samples preparation

Some of examined diarrhea samples The preparation process was done by:

2.3.1. Macroscopic Examination

The samples were examined by observing the strength ,color ,smell of the stool and presence of mucus ,blood and fats [11].

Direct Smear Method

Stool specimens were examined using the direct smear technique. A small amount of fecal material was placed on a clean glass slide and mixed thoroughly with a drop of normal saline (0.9%) and, when required, iodine stain using a wooden applicator stick. The preparation was then covered with a coverslip and examined microscopically under magnifications of 40× and 100× [12].

2.4. Indirect Flotation Technique

- **Materials:**
- Stool sample
- Slide
- Saturated salt solution (NaCl)
- Gauze
- Test tube
- Cover slide
- Microscope
- **Procedure:**
- 1-Mix approximately 1–2 grams of stool with 10 ml of flotation solution.
- 2-Strain the mixture through gauze into a test tube to remove debris.
- 3-Fill the tube until a slight positive meniscus forms.
- 4-Place a slide gently on top of the tube.
- 5-Allow it to stand for 10–15 minutes.
- 6- Carefully lift the cover slide and place it on a slide.
- 7- Examine under a microscope using 10× and 40× objectives (Garcia,2007)
- Formalin–Ether Sedimentation Technique
- **Procedure:**
- 1-A drop of stool was placed on a clean glass slide, spread out until the sample was completely transparent, and left to air dry for approximately 20 minutes.
- 2-Filter the mixture through gauze into a conical centrifuge tube..
- 3-Cap the tube and shake vigorously for 30 seconds.
- 4-Centrifuge at 1500–2000 rpm for 2–3 minutes.
- 5- Transfer a drop of the sediment to a slide After centrifugation, cover with a cover slip, and examine under a microscope.

2.5. Statistical analysis

The collected stool samples were analyzed statistically by calculating the percentage (%) of samples infected with *G. lamblia*. The percentage was calculated according to the following equation: percentages

$$\text{Percentage (\%)} = \frac{\text{Number of Sample}}{\text{Total Samples}} \times 100\%$$

3. Results

3.1. Total infection rate *G. lamblia* in diarrhea in Babylon province

Table(1) The study found that there were instances of intestinal parasites. indicates the number of people investigated, the number of people affected, and the total giardiasis incidence, giardiasis 88 (25.5%). from a total of stool samples.

Table 1 Total infection rate *G. lamblia* of examined microscopically province.

Stool sample	No. of host examined	No. of host Infection	Percentages
	145	88	25.5%

3.2. The percentage of Infection for The According *G. lamblia* to gender.

Table (2) presents the number and percentage of children infected with intestinal parasites in Babil Governorate. The number of children infected with intestinal parasites was 88(100%) out of a total of children whose stool was examined. It was also found that the number of infected males reached 56, representing a (63.6%) infection rate, which is higher than the number of infected females, which reached 32, representing 36.3% of the total infections

Table 2 Percentage of Infection for The According *G. lamblia* to gender.

Sex	No. of host Infection	Percentage
Male	56	63.6%
Female	32	36.3%
Total	88	100%

3.3. Distribution of Infected Cases by Age Group within each Gender

Table 3 show intestinal parasite infection rates among children of both sexes in Babil Governorate by age group. The highest infection rate 35 cases (40.9%) was in the age group of 11–12 years and lowest was in children less than 2 years, three cases (3.4%). As concerns infection distribution within each gender, the 8-10 years age group accounted for the highest proportion among males (50%) and similarly, on a sex-disaggregated basis, we also found the lowest male rate in the 2–4 years age group (3.5%). In females, the largest percentage of infection was seen in the 5–7 years age group (17 cases, 30.3%) and none were found among children under 2 years of age (0.0%).

Table 3 Distribution of Infected Cases by Age Group within Each Gender

Age Group	Infected	percentage	male	% of Total Males (56)	Female Cases	% of Total Females (32)
>2	3	3.4%	3	5.3%	0	0.00%
2-4	17	19.3%	2	3.5%	5	15.6%
5-7	11	12.5%	6	10.7%	17	30.3%
8-10	21	23.8%	28	50%	8	25%
11-12	36	40.9%	17	30.3%	2	3.57%

3.4. Distribution by area of residence

Table (4) show children living in urban areas had higher infection rate 21 (23.8%) compared to those in rural areas 67 (76.1 %). Urban overcrowding and limited access to clean water in some neighborhoods may contribute to this trend.

Table 4 Distribution by area of residence

Area of Residence	Number of Infected Children	Percentage (%)
Rural	67	23.8 %
Urban	21	76.1%
Total	88	100%

As shown in Table (5), it can be clearly seen that the prevalence of *G. lamblia* was higher among children whose fathers had never been to school compared with those who were educated when comparing 60.2% and 39.7%, respectively. Similarly, mothers with no formal education had a higher prevalence of infection compared to mothers who were educated (20.4% vs 79.5%, respectively). Parental educational level is associated with the presence of *G. lamblia* in children.

Table 5 Prevalence of *G. lamblia* infection according to the educational level of fathers and mothers.

Parent Education Level	No. of Infected Children	Percentage (%)
Father - Educated	35	39.7%
Father - Uneducated	53	60.2 %
Mother - Educated	70	79.5%
Mother - Uneducated	18	20.4%

4. Discussion

According to a study submitted to the World Health Organization and the United Nations, giardiasis is more common in developing countries and accounts for a significant proportion of deaths among children under five worldwide [13]. In present work, the incidence of infection with *G. lamblia* in diarrheic children in Babil was 88(25.5%) which is more or less. The current study determined the prevalence of *Giardia lamblia* infection in children in a number of hospitals in Babil, along with the possible risk factors associated with instances of giardiasis. Giardiasis infection was discovered in this type of study through either the flotation technique or direct examination under a microscope. Similar to many studies in Iraq, including in Babil city [14], in Baghdad [15]. The present study demonstrated that the prevalence of *G. lamblia* infection was higher among males, accounting for 56 cases (63.6%), compared with females. In agreement with other studies conducted in Karbala [16], in Duhok [17], and in Babylon and in Kirkuk [18], where the males recorded an infection rate (5.8%, 6.12%, 42.8% and 34.14%) were higher than females (4.1%, 5.4%, 9% and 32.85%) respectively; On the other hand, it disagrees with most of the studies done in Missan [19], Duhok [20] and Baghdad [15] because they recorded the infection among females more than (35.86%, 64.5% and 11.84%).

This study showed that the males have a higher risk of infection with *G. lamblia*, which is a finding consistent with several other previous studies conducted in Iraq and other countries, in which the rates were reported as 16.59%, 35.5% and 9.82% respectively. The likely reason for this higher prevalence on males may be their greater mobility and outdoor activities, which would expose them to contaminated environmental conditions more often than women and thus increasing the risk of infection [21]. Distribution by area of residence: Children living in urban areas had a higher infection rate 67 (23.8 %) compared to those in rural 21 (76.1%) areas. This study disagrees with Mohsen (2012) who showed in an epidemiological study she conducted on patients arriving at Al-Sadr General Hospital and Al-Munathira General Hospital in Najaf Governorate that the percentage of those infected with intestinal parasites in the city was lower than the percentage of those infected in the countryside, as it reached (12.4%). Results from the present study showed that inferior wide education of parents in greater an [5], in Mexico [22], in Kirkuk [18] or in Portugal [10], This is because the extended areas of the case and its surroundings are more and more prone to intestinal parasites than the cities due to several conditions and circumstances, including the usual lack of sanitation services, and finally, the availability of drinking water suitable for human consumption, the desire for general cleanliness, and the focus on other animals from others.

5. Conclusions

The study community had a high frequency of *G. lamblia*, with 88 (25.5%) children infected.

Highest Infection Rate in 11–12 years old. The infection rate was much higher for male children as compared to female.

The infection rate among children living in rural areas was slightly higher than the infection rate among children living in urban areas. The infection rate was higher among children whose parents were uneducated.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

Statement of informed consent

Informed consent from all participation was obtained.

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