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Original Research Article

Study the Prevalence of Some Intestinal Parasites among Children in Tikrit City

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Abstract: The present study on the prevalence of intestinal parasitic infection from October 2025 until the April 2026, was conducted among children aged (2 months to 18 years) years admitted Tikrit teaching hospital in Tikrit city were suffering from diarrhea and other gastrointestinal disorders. 872 specimen were choosen randomly and examined, A total of 350 parasite stool specimens from patients with gastrointestinal disorders and 307 (87.7%) samples from infected patients with protozoa and samples from infected patients with helminthes 43(12.29%) examined under a microscope. The collected samples were distributed total protozoa the major occurrence frequency was *Giardia lambilia* 134 (38.3%), followed by *Entamoeba histolytica* in a percentage of 97 (27.7%) and *Cryptosporidium parvum* in a percentage of 76 (21.7%) respectively. As well as, recorded as the percentage of total helminthes isolates in patients suffering from disorders and diseases of the digestive system showed *Ascaris lumbricoides* a percentage 34 (9.7%) isolated from the stool sample, While *Enterobius vermicularis* recorded in 9 (2.5%) in patients with gastrointestinal disorders**.** The gender group with the highest average range of the Male patient group with intestinal parasite infected 187 (40.2%). Additionally, the distribution of participants across gender group is displayed in the same table, which also showed Female patient group with intestinal parasite infected 163 (40.0%). ***Conclusion*:** These findings highlight the substantial burden of IPIs among Tikrit city preschool and school-aged children, with *Giardia lambilia* infection was major occurrence frequency associated with intestinal disorder. As well as Protozoa and Helminthes infection were increased in 6-11 age groups and was high in male than female groups identified in this study.

Keywords: *Giardia Lambilia*, Gastrointestinal Disorders, *Enterobius Vermicularis*, *Ascaris Lumbricoides*, Helminthes, Protozoa.

INTRODUCTION

As a result of its significance for travelers, immigrants, and those with impaired immune systems, parasitic infections are gaining more and more attention in developed nations. Intestinal parasites, such as helminths and protozoa, are among these of medical significance and are a prevalent public health issue in tropical and subtropical regions (Fauziah *et al*., 2022). Helminths are particularly prevalent and crippling in youngsters, and they likely infect about 2 billion people (Chelkeba *et al*., 2022). Numerous research on intestinal parasite prevalence conducted around the world have demonstrated a connection between environmental changes and the infection's occurrence (Daryani *et al*., 2017). The prevalence of intestinal parasite infections in Iraq is influenced by ecological variables, the impact of crowding, individual and communal cleanliness, and sanitation. Numerous research conducted on various Iraqi communities produced varying findings. Because children between the ages of 5 and 14 are more prone to contracting diseases, the prevalence of intestinal parasite infection was investigated in this age group. Significant regional variations in intestinal parasite infections (IPIs) have been noted (Kunwar *et al.*, 2017). A meta-analysis of 56,786 preschoolers and schoolchildren in Ethiopia found that the overall prevalence of IPIs was 48% (Hajissa *et al*., 2022). A lower pooled prevalence of 38% was found in a meta-analysis involving 68,532 school and preschool-age children. Nepal, on the other hand, had a far lower frequency, with an overall rate of 20.4% recorded between 2011 and 2015 (Abdoli *et al.,* 2024).

1. The human gut has been found to contain hundreds of distinct microbiota species. The gut microbiota in healthy people protects against infection through a variety of mechanisms, such as immunological activation, bacteriophage deployment, nutrition competition, antimicrobial product secretion, and maintenance of the integrity of the epithelial barrier (Girma and Genet, 2024). These systems work together to provide resistance to foreign microbial invasion. Intestinal imbalance may be exacerbated by parasitic infections. Numerous parasite species, including *Blastocystis, Giardia, Cryptosporidium, Trichuris, Entamoeba histolytica,* and *Nippostrongylus brasiliensis,* have been demonstrated in earlier research to infiltrate the intestinal epithelium, harm the barrier, and induce intestinal inflammation (Kapczuk *et al*., 2020). The National Institute of Allergy and Infectious Diseases has designated Entamoeba histolytica as a category B priority biodefense pathogen due to its low infectious dose, resistance to chlorine, and environmental stability. These characteristics may make it easy for the pathogen to spread through contaminated food and water sources. These characteristics of the parasite cause epidemics among the general public and military, even in low-incidence environments (Chowdhury *et al*., 2022); (Ahmed and Belayneh, 2019).

Aim of Study

To assess the frequency of intestinal parasite infection s in preschoolers and school-age children in Tikrit city, look at changes over time, and pinpoint risk variables. This study provides a thorough grasp of the parasitological environment, identifies high-risk populations, and synthesizes data from across the nation.

METHODS

Specimen Collection

The study included collecting of (872) stool samples from the children who admitted Tikrit teaching hospital in Tikrit city were suffering from diarrhea and other gastrointestinal disorders. The children ages ranged from 2 months to 18 years.

The collection period was from the beginning from October 2025 until the April 2026. The following information were recorded which included: gender, age, residential area and the clinical symptoms.

The stool samples were collected in new and sterile and dry plastic cup with ensuring the maximum speed no more than one hour between the collection and the examination of the samples. The stool samples were examined via taking a small amount of the stool from different parts by using the wooden stick, subsequently placing it on the glass slide with mixing it together with normal saline, after that covering it by coverslip. Then, a portion of the same sample placed on the slide and mixed together with aqueous iodine solution to ensure the details which cannot be observed in unstained samples in addition to detect of the cystic and trophozoite stages. The coverslip was applied above the slide and then the slides examined under low and high magnification of the microscope for all the samples (Garcia, 2007).

Stool Specimen

An intestinal disease diagnosed by a doctor or a parasitic and Helminthes infection diagnosed through laboratory testing. The samples were placed in special sterile tubes for stool collection, and then examined under a microscope first without staining and later using two types of stains. It was reported that stool samples were collected using a sterile cap and transferred to a tube containing tetrafluoroethylene culture medium. Examination was performed by taking a sample from the cap and placing it on a slide. Microscopic examination revealed the characteristics of the samples (color, consistency, blood, mucus, and odor).

Stool Samples Examinations

A-Macroscopic Examination: Stool sample were collected from all (male, female). The stool consistency were recorded along with blood and mucus.

B- Microscopic Examination (Direct Wet Mount): Small amount of stool mix with normal saline, then examination using magnification forces x10 and the forces x40 of the microscope. The stool sample preparation process and clarification that this test with iodine is used to diagnose cysts of parasites.

Statistical Analysis

Data analysis was carried out using the Statistical Package for the Social Sciences software version16 (SPSS). For the descriptive data, frequencies and percentages were used to describe the characteristics of the participants.

RESULTS

A total of 350 parasite stool specimens from patients with gastrointestinal disorders and 307 (87.7%) samples from infected patients with protozoa and samples from infected patients with helminthes 43(12.29%) examined under a microscope. The collected samples were distributed total protozoa the major occurrence frequency was *Giardia lambilia*

134 (38.3%), followed by *Entamoeba histolytica* in a percentage of 97 (27.7%) and *Cryptosporidium parvum* in a percentage of 76 (21.7%) respectively. As well as, recorded as the percentage of total helminthes isolates in patients suffering from disorders and diseases of the digestive system showed *Ascaris lumbricoides* a percentage 34 (9.7%) isolated from the stool sample, While *Enterobius vermicularis* recorded in 9 (2.5%) in patients with gastrointestinal disorders shown in table 1.

Table 1: Show the results of incidence rata according to types of intestinal parasites among positive samples:

Parasite	Items	Number of infected cases	Infection rate % from the total positive
Protozoa	*Giardia lambilia*	134	38.3
	Entamoeba histolytica	97	27.7
	Cryptosporidium parvum	76	21.7
Total protozoa		307	87.7
Helminthes	*Ascaris lumbricoides*	34	9.7
	Enterobius vermicularis	9	2.5
Total helminthes		43	12.29
Total parasite		350	100

The gender group with the highest average range of the Male patient group with intestinal parasite infected 187 (40.2%). Additionally, the distribution of participants across gender group is displayed in the same table, which also showed Female patient group with intestinal parasite infected 163 (40.0%).

Table 2: Show prevalence of intestinal parasite infections by gender.

Gender	Number of cases	Number of infected	Infection percentage %
Male	465	187	40.2
Female	407	163	40.0
Total	872	350	40.18

A total of 350 parasite stool specimens from patients with gastrointestinal disorders and 307 (88%) samples from infected patients with protozoa and samples from infected patients with helminthes 43(12%) examined under a microscope. The collected samples were distributed total protozoa the major occurrence frequency was *Giardia lambilia* 55(41%) in 6-11 Age group (year), followed by *Entamoeba histolytica* in a percentage of 49(51%) in same age groups and *Cryptosporidium parvum* in a percentage of 36(47%) in same age groups respectively. As well as, according to gender recorded 160(52%) as the percentage of total protozoa infections isolates in male patients suffering from disorders and diseases of the digestive system showed in female a percentage 147(48%) isolated from the stool sample.

While recorded as the percentage of total helminthes isolates in patients suffering from disorders and diseases of the digestive system showed *Ascaris lumbricoides* a percentage 18(53%) in 6-11 Age group (year) isolated from the stool sample, While *Enterobius vermicularis* recorded in 4(45%) in same age groups in patients with gastrointestinal disorders as shown in table 3. according to gender recorded 27(63%) as the percentage of total helminthes infections isolates in male patients suffering from disorders and diseases of the digestive system showed in female a percentage 16(37%) isolated from the stool sample.

Table 3: The percentage of parasitic infections in patients with intestinal disorders according to the species of organisms

Items	Age group (year)				Gender		Total parasites
	<2	2-5	6-11	12-18	male	female	350 (100%)
Entamoeba histolytica	1(1%)	24(24%)	49(51%)	23(24%)	42(43%)	55(57%)	97(32%)
Giardia lamblia	4(3%)	36(27%)	55(41%)	39(29%)	73(54%)	61(46%)	134(43%)
Cryptosporidium parvum	1(1%)	18(24%)	36(47%)	21(28%)	45(59%)	31(41%)	76(25%)
Total protozoa infections	6(2%)	78(25%)	140(46%)	83(27%)	160(52%)	147(48%)	307(88%)
Helminthes							
Ascaris lumbricoides	0(0%)	12(35%)	18(53%)	4(12%)	21(62%)	13(38%)	34(79%)
Enterobius vermicularis	2(22%)	2(22%)	4(45%)	1(11%)	6(67%)	3(33%)	9(21%)
Total helminthes	2(5%)	14(33%)	22(51%)	5(11%)	27(63%)	16(37%)	43(12%)

A total of 350 participants, concerning clinical characteristics, the presence of IPIs was significantly associated to Abdominal pain 101 (28.8%), Fever 79 (22.5%), Diarrhea 74 (21.1%), Vomiting 45 (12.8%), Perianal pruritus 23 (6.5%), Rectal prolapse 1 (0.28%) and Bloody diarrhea 27 (7.7%). According to these data disease may result from IPs in patients with gastrointestinal disorders, as shown in table 4.

Table 4: Show Clinical symptoms percentage of infected patients

Clinical symptoms	Number of patients	Percentage
Abdominal pain	101	28.8
Fever	79	22.5
Diarrhea	74	21.1
Vomiting	45	12.8
Perianal pruritus	23	6.5
Rectal prolapse	1	0.28
Bloody diarrhea	27	7.7
total	350	100

Seventy nine subjects (22.5 %) lived in urban areas in Tikrit city center and 271 subjects (77.4%) lived in rural areas in Village of salah al-din as shown in Table 5.

Table 5: Show the Spreading of Parasites ptotozoa and helminthes by Area (urban- rural)

Area		Number of parasites	percentage
Urban	Tikrit city center	79	22.5
Rural	Village of salah al-din	271	77.4
Total		350	100

DISCUSSION

The result showed that the percentage of IPI in the current study was 307 (87.7%) samples from infected patients with protozoa and samples from infected patients with helminthes 43(12.29%) examined under a microscope among people in the Tikrit city province. This present percentage of total infection nears many studies such as the study of Al-Hasheme *et al.,* (2020) in the holy city of Karbala, Iraq. The overall incidence of intestinal parasites was infected patients with protozoa was18.93% (Jaeffer, 2013). In Al-Shulaa and Al-Khadimya Baghdad, Iraq, the percentage of infection is 13.64% (Khalil, 2018); also in Erbil City, the percentage of infection is 14% (Nayyef, 2022). In Al-Furat General Hospital, Baghdad, Iraq, the result showed that the incidence of E. histolytica was 15.89% among 497 patients (Zaki 2022). The results revealed that there were variations in the overall percentage of IPI, which may be influenced by various environments and areas where the samples were obtained.

The result showed that the highest rate of IPI in Karbala province was in the males (14.1%), whereas the lowest rate of infection in the females in 10-21 Age group was 11.7% lived in rural areas. The current study agreed with the study in Mosul, Iraq, which recorded that the highest rate was in the males (9.59%) lived in urban areas, whereas females had the lowest infection rate (6.19%) (Siddig, 2017). The current study also agreed with the study in Khartoum, Sudan, which recorded the highest rate of infection among males (80%) and the lowest infection rate among females (60%) (Abioye *et al.,* 2019). Physiological variables, which are typically hormonal in nature, and ecological (sociological in humans) factors are typically attributed for these variations. Differential exposure to infections due to sex-specific behavior or morphology is a result of ecological variables (Callixte *et al*., 2019). Variations in endocrine–immune interactions can also be invoked to explain these differences in infection between genders. Additionally, sex steroids, particularly androgens in males and estrogen in females, alter a variety of aspects of host immunity by regulating the expression of Tolllike receptors, cytokines, and antibodies. Androgens also lower immune competence. The steroid hormones have an impact on the genes and behaviors that increase male susceptibility to infection and disease. The lesser incidence in females in 6-11 Age group may also be related to their greater attention to personal cleanliness (Andreyev *et al*., 2025).

This study found that patients with gastrointestinal disorders with Abdominal pain, Fever and Diarrhea a wide range of symptoms and conditions affecting the digestive system, from functional issues like irritable bowel syndrome to more serious diseases (Scarlata *et al*., 2025).

Common symptoms include abdominal pain, bloating, constipation, diarrhea, nausea, and vomiting. Management often involves, addressing physical symptoms, psychological factors, and lifestyle choices (Ullah *et al.,* 2025). It suggests a significant prevalence of parasitic involvement in their conditions. This observation warrants further investigation into the specific protozoa species present and their potential roles in the patients' gastrointestinal issues were present in the samples taken from the patients' gastrointestinal tracts. The presence of specific parasitic infections may be linked to the symptoms experienced by the patients, and understanding this link can lead to more targeted and effective treatments (Oliveira *et al*., 2015).

Amebiasis can be diagnosed using a variety of specialized tests, each with varying degrees of sensitivity and specificity. The test is nonspecific because it cannot differentiate E. histolytica from the non-pathogenic E. dispar and E.

moshkovskii, and it is plagued by false positives from misidentification of macrophages, trophozoites, polymorphonuclear leukocytes (PMN), and cysts. Wet preparation of concentrated fecal samples necessitates knowledge of the morphology of various Entamoeba species (Dąbrowska *et al*., 2024).

Numerous parasites that formerly threatened the world's poorest nations have adapted to climate change and are now widespread. Therefore, in order to effectively address these worldwide biological risks, innovations and health practices are required. Laboratory diagnostic tests are essential for identifying parasites and, consequently, for determining the proper course of treatment (Elghryani *et al*., 2025).

Nevertheless, our findings contradict the research conducted by Das S, *et al.,* which identified a presence of *E. histolytica and* i *cryptosporidum* n specimens of stool using a variety of diagnostic methods. Their study revealed that only 3.17% of the evaluated patients had positive samples when examined under a microscope (Kamal, 2023). Furthermore, it diverges with a research conducted in Malaysia by Ngui *et al*., which discovered a 17.6% prevalence of amoebic forms detected using microscopy. Prior studies have also demonstrated a significant prevalence of Entamoeba infection in rural settings, with rates ranging from 9.4% to 21.0%.

The present study agreement with study Kamal in Kirkuk city in 2023 demonstrated that rate of Entamoeba detected out of 200 specimens tested via microscopy, 94(47%) specimens tested via microscopy, 94(47%) specimens were positive for *Entamoeba*, While the remaining 106 (53%) were negative for any amoebic forms (Kamal, 2023).

CONCLUSIONS

These results demonstrate the significant prevalence of IPIs among preschoolers and school-age children in Tikrit City, with Giardia lambilia infection being a prominent occurrence frequency linked to intestinal disorders. Additionally, protozoa and helminthes infections were more common in the 6–11 age group and were more common in males than in females.

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