

Giardiasis in Iraq: A Review

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ABSTRACT

Background: Giardiasis, is a disease caused by the *Giardia lamblia*, found in many regions of the world, including Iraq. It affects different age groups of people, especially children and causes symptoms, including abdominal pain, diarrhea and weight loss.

The aim of this review is to find the prevalence of giardiasis among many cities and governorates in Iraq and the extent of the influence of age, sex, area of residence and seasons of the year on its spread.

Conclusion: Numerous previous studies indicated the spread of giardiasis in many cities and governorates in Iraq and the young age group showed a higher rate of prevalence than the other groups. Males are also recorded higher infection rate than females. Also, the infection rate in rural areas was higher than in urban areas. It is also evident that the seasons had an effect on the parasite's existence and, consequently, the spread of this sickness.

Keywords: *Giardia lamblia*, Giardiasis, Prevalence.

مرض الجيارديا في العراق: مراجعة

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الخلاصة

الخلفية: داء الجيارديا ، الذي يسببه طفيلي جيارديا لامبليا ، وهو مرض شائع في معظم دول العالم، بما في ذلك العراق. يصيب مختلف الفئات العمرية من الأشخاص وخاصة الاطفال.

الهدف من الدراسة: الهدف من هذه المراجعة معرفة مدى انتشار داء الجيارديا بين العديد من مدن ومحافظات العراق ومدى تأثير العمر، الجنس، منطقة الإقامة وفصول السنة على انتشاره.

الاستنتاج: اشارت العديد من الدراسات السابقة الى انتشار داء الجيارديا في العديد من مدن ومحافظات العراق، وقد اظهرت الفئات العمرية الصغيرة معدل انتشار اعلى من المجموعات الاخرى. كما تم تسجيل معدل اصابة في الذكور اكثر من الاناث، كما ان معدل الاصابة في المناطق الريفية كان اعلى منه في المناطق الحضرية، ومن الواضح ايضا ان لفصول السنة كان تأثيرا " على حياة الطفل وبالتالي على انتشار المرض.

الكلمات المفتاحية: جيارديا لامبليا، داء الجيارديا، معدل الانتشار .

INTRODUCTION

Giardia lamblia (G. lamblia) (known as intestinal lamblia and *Giardia duodenalis*) is a protozoan flagella organism that multiplies in the small intestine, forming colonies that cause giardiasis¹. It is a disease characterized by severe and greasy diarrhea (without mucus, pus or blood), flatulence, belching, nausea, vomiting, loss of appetite, and also leads to poor intestinal

absorption of nutrients² infection occurs through drinking water from springs, ponds, and mountain rivers, or contaminated food, as well as through contamination with the faeces of people infected with this disease that are contaminated with the cyst of this parasite symptoms begin to appear 9–15 days after the infection, If left untreated³ the disease will persist for 6 weeks or more in healthy people, It persists for much longer in immunocompromised people. Giardia adheres to

the epithelium of the intestine by an adhesive ventral disc and reproduces by simple dividing. *Giardia* is confined to the lumen of the small intestine and does not spread through the bloodstream or to other gastrointestinal areas. Thus, *Giardia* can absorb its own nutrition from the lumen of the small intestine during its active phase⁴.

Giardia encompasses more than fifty species, according to protozoan morphology and the host species in which they parasitize. Currently, there are five species of *Giardia*: *G. muris*, *G. agilis*, *G. duodenalis*, *G. ardeae*, and *G. psittaci*. The only *G. lamblia* species known to exist is thought to infect both domestic and wild mammals in addition to humans. Eight genetic categories for groups found in man and isolated from animals like beavers and mice have been identified by molecular investigations⁵.

Life Cycle

Giardia lamblia affects humans and is one of the most prevalent parasites that infect other mammals and birds, including cats, dogs, beavers, cattle, deer, and sheep⁶.

The parasite lives in two phases during its life, beginning with the inactive (cyst) phase, and during this phase it is present in the faeces of the infected person. and polluted surface water, and during this phase it is characterized by the ability to resist heat and cold and resist traditional methods of water sterilization, so it can remain for weeks or months⁷.

After ingestion by the host of the parasite (cyst), it turns into the active stage (trophozoite) and begins to reproduce (asexually) in the small intestine. This results in active phases and cystic phases that are excreted in the faeces⁸ (Figure 1).

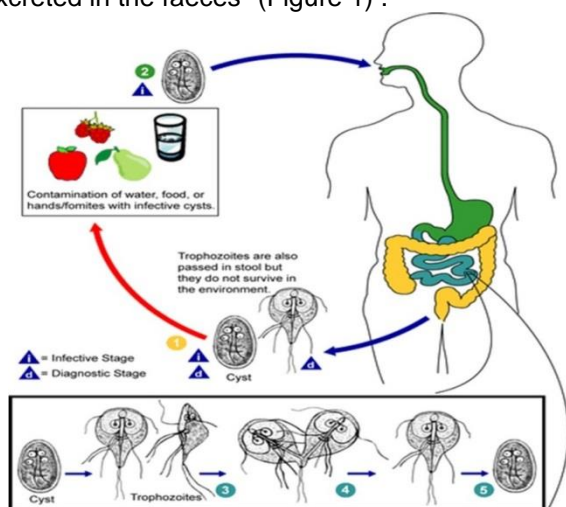


Fig1 Life cycle of *Giardia lamblia* (CDC - DPDx – Giardiasis 2017)⁹

Epidemiology

Giardia spreads in all regions of the world and is the main cause of diarrheal disease, especially in children¹⁰. The disease can occur in all seasons of the year, but it has been observed that it increases in the late summer to the beginning of autumn. The disease affects males at higher rates than females, and infection can occur at any age, but children are more affected. This parasite can cause asymptomatic infection or can lead to acute or chronic diarrheal illness. The parasite is found in around 80% of lake, stream, and pond water samples and 15% of filtered water samples. In impoverished nations, it is a prevalent cause of chronic diarrhea and delayed growth in children¹¹ (figure 2).

Symptoms

Giardiasis symptoms and signs can vary, and some people may have it without presenting any signs¹². Symptoms, when they occur, can last two weeks or more. Diarrhea, gas, oily or foul-smelling faeces, and stomach or abdominal discomfort are the most prevalent symptoms. With malaise, fatigue, and bloating, nausea and vomiting may ensue. Together, the symptoms can lead to dehydration¹³.

Risk Factors

The parasite is spread in developing countries and is transmitted through food and water contaminated with cysts of the parasite. And because infection can occur in the presence of only ten cysts of this parasite, the possibility of exposure to people working in health care centres is great. The disease also spreads to people who suffer from malnutrition, immunodeficiency, or cystic fibrosis, and groups at risk of giardiasis include travellers to endemic areas¹⁴.

Children are significantly more likely than adults to get giardiasis. Particularly if they use diapers, are in the process of toilet training, or spend time in a day care facility, children are more likely to come into contact with excrement. Additionally, those who live or work around young children are more likely to contract *Giardia* individuals without access to clean water¹⁵. *Giardia* infection is common wherever there is poor sanitation or unsafe drinking water. You run the risk of contracting *G.* if you visit areas where it is common, especially if you don't watch what you eat and drink. In wilderness or rural areas, the risk is greatest¹⁶.

Prevalence of Giardiasis in Iraq

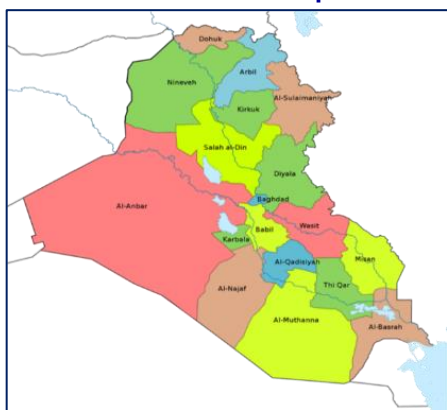


Fig2. Map of Iraq (wikipedia, 2022) ¹⁷

Table 1. Prevalence of giardiasis in Iraq.

Year	Infection rate %	*Governorate or ** City	Reference
2005	12.31	Kirkuk C.	(18)
2012	37	Nineveh G.	(19)
2012	30.93	Basrah G.	(20)
2012	14.6	Al-Anbar G.	(21)
2013	11.92	Duhok C.	(22)
2013	26.1	Babylon G.	(23)
2014	4.09	Babil C.	(24)
2014	36.7	Al-Diwaniya G.	(25)
2016	9.35	Kirkuk G.	(26)
2017	3.9	Samara C.	(27)
2017	7.6	Duhok & Erbil C.	(28)
2017	9.72	Erbil G.	(29)
2019	5.94	Basrah C.	(30)
2019	11	Baghdad C.	(31)
2019	31	Baghdad C.	(32)
2020	15.37	Nineveh G.	(33)
2020	14.30	Tikrit C.	(34)
2020	58.0	Kirkuk G.	(35)
2022	0.86	Mosul C.	(36)
2022	28.0	Babylon G.	(37)

*Governorate: G.

** City: C

Table 2. Prevalence of giardiasis in relation to area of residence

Year	Location /	infection rate	Governorate or City	Reference
	Urban	Rural		
2010	15.2	28.2	Thi-Qar G.	(37)
2010	22.64	20.55	Sulaimani C.	(38)
2012	34.69	25.49	Erbil G.	(39)
2013	22.9	28.7	Duhok C.	(22)
2015	34	66	Al-Muthana G.	(40)
2019	34.09	65.9	Duhok C.	(32)
2020	11.54	20.87	Tikrit C.	(34)

Table 3. Prevalence of giardiasis based to the sex.

Year	Sex/ infection rate		Governorate or City	Reference
	Male	Female		
2006	41.6	35.6	Duhok	(41)
2009	20	25.0	Sulumanya C.	(42)
2010	9.82	11.48	Baghdad C.	(43)
2010	24.7	22.5	Thi-Qar G.	(37)
2011	59.9	56.2	Baghdad C.	(44)
2014	28.4	31.6	Basrah G.	(45)
2015	48	52.0	Al-Muthana G.	(46)
2017	44.4	55.5	Samara C.	(27)
2019	50.65	44.35	Babil C.	(24)
2020	17.30	11.22	Tikrit C.	(34)
2020	34.14	32.85	Kirkuk G.	(35)
2022	0,52	0.34	Mosul C.	(47)

Table 4 Prevalence of giardiasis based on the age.

Year	Age/		Infection rate (%)	Governorate or City	Governorate or City	Reference
	Kindergarten school	Primary school				
2006	45.6	419.	-	-	Dohuk G.	(41)
2009	55	45.0	-	-	Sulymana C.	(42)
2010	13.75	13.72	17.64	-	Baghdad C.	(43)
2010	27.7	16.6	-	-	Thi-Qar G.	(37)
2011	52.6	71.4	55.1	-	Baghdad C.	(44)
2014	36.9	37.1	23.6	-	Basrah G.	(45)
2015	60	60.0	32	-	Al-Muthana G.	(46)
2017	30	25	50	-	Samara C.	(27)
2019	13.07	20.76	27.69	-	Babil C.	(24)
2020	40	-	-	-	Kurkuk G.	(35)
2020	22.7	22.7	25.32	-	Nineveh G.	(33)
2022	59.07	0.34	0	-	Mosul C.	(47)
2022	16.5	0	0	-	Babylon G.	(36)

Table5. Prevalence of giardiasis according to the year months

year	Months												Governorate or City	Reference
	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.		
2006	39.1	34.9	41.8	43.5	43.4	28.4	34.1	-	-	40.0	44.8	49.2	Duhuk G.	(41)
2014	33.7	30.7	15.4	28.9	36.1	-	-	-	22.4	32.6	36.8	31.5	Basrah G.	(45)
2017	30.0	8.0	0.0	-	-	-	-	-	-	8.0	30.0	24.0	Al-Muthana G.	(45)
2015	50.0	50.0	49.9	-	-	-	-	49.95	49.9	50.0	49.95	50.	Samara C.	(27)
2017	-	-	-	-	-	19.08	20.4	21.7	13.1	7.89	9.21	8.55	Kirkuk G.	(35)
2019	3.5	5.66	0.78	1.63	2.75	2.82	5.5	5.52	5.61	4.59	2.61	5.7	Babil C.	(24)
2020	6	9.80	11.32	28	23.07	25.49	15.3	12	11.76	13.46	7.84	-	Tikrit C.	(34)

Table1 showed a different variation in the severity of giardia infection among the cities and governorates of Iraq and for the different years, as the highest infection rate appeared in Kirkuk Governorate for 2020 and the lowest infection rate in Mosul, with 0.86%^{35, 47}.

This discrepancy in results is due to several factors, including age, sex, climate, educational level of parents, health habits, availability of potable water, and hygiene conditions before eating.

According to several studies, there was a significant disparity between urban and rural areas in terms of the rates of *G. lamblia* infection, with the rate of infection in rural areas being greater than in urban areas, as shown in table 2.

A lack of access to clean drinking water and reliance on river water as a direct source of water; dealing with parasite-infested soil in farms and

gardens; breeding and contact with animals that are parasite reservoirs; and the use of animal waste as organic fertilizer may all contribute to high infection rates in rural areas. The rural population's poor health and cultural levels, including relative crowdedness, inadequate sanitation, low socioeconomic status, and poor personal hygiene habits, all contribute to a rise in illnesses^{48, 49}.

Several studies revealed a significant difference in the frequencies of *G. lamblia* infection based on the gender of the patients. According to table 3, the infection rate among men was higher than that among women because they are more mobile and energetic, frequent in public spaces, and constitute the working class in society as they may be by their food and drinks from mobile vendors.

These variances in environmental influences and physiological ones, which are first hormonal, lead to different responses to infection between male

and female⁵⁰. Variations in endocrine-immune interactions can also be used to explain these discrepancies in infection between the sexes. Androgens in males and estrogens in women both affect immunological competence by modifying several aspects of host immunity. Males are more susceptible to illness and infection due to the ways in which steroid hormones alter the genes and behaviours of men⁵¹. The lesser incidence in females may also be related to their greater attention to personal cleanliness⁵².

As shown in Table 4, with regard to the association of age with the rate of infection with giardiasis, children are more susceptible to infection with this disease for several reasons, including inadequate toilet training and health hygiene, overcrowding, children's low levels of education, their low socioeconomic status, and environmental conditions. Children may be more susceptible to infection because they are more physically active, less likely to wash their hands after using the restroom or before eating, and more likely to play in ponds or sewers with stagnant water that may be infected⁵².

G. lamblia was found in stool samples taken from children in all primary schools; however, children attending a primary school in a poor socioeconomic neighborhood had the highest risk of infection. Asymptomatic patients in the community may be a primary source of infection since they routinely excrete cyst stages in their faeces and thus contribute to the spread of giardiasis^{34, 41}.

Giardiasis is more common in the summer months, as shown in table 5, because there are more opportunities for the parasite to thrive: more people are drinking juice and water, more ice is created from unsterilized water, and there are more insects that act as mechanical carriers of the parasite cysts. Will the cold weather inhibit the trophozoites, which is what causes the infection rate to decline in the winter⁵³.

CONCLUSION

Although the incidence rates of giardiasis vary from region to region depending on the level of individual and community cleanliness, environmental factors such as sanitation and climate play an important role in its spread in Iraq. In view of the health problem this disease causes to children and adults alike, primary health and health education for the family must be given attention and potable water supply, sanitation, healthy nutrition, comprehensive treatment, and avoiding crowding among children, especially in schools.

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