World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(REVIEW ARTICLE)

Giardia lamblia Infection: A review of the current literature

Inggil Mukti Gunawan [1], Alpha Fardah Athiyyah [2,*] and Heny Arwati [3]

[1] *Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia.*
[2] *Department of Pediatrics, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.*
[3] *Department of Medical Parasitology, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia.*

World Journal of Advanced Research and Reviews, 2025, 28(02), 126–130

Publication history: Received on 24 September 2025; revised on 01 November 2025; accepted on 03 November 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.28.2.3715

Abstract

Giardia lamblia infection (giardiasis) is a common intestinal parasitic infection worldwide, particularly prevalent in children from low or middle-income countries. The infection manifests with a range of clinical outcomes with potential long-term effects on nutrient absorption and child growth. The aim of this review is to synthesize existing research and provide a comprehensive understanding of giardiasis. Studies reviewed were obtained from PubMed, ScienceDirect, and Google Scholar within the last ten years. Giardiasis can lead to significant health issues if not diagnosed and treated promptly, emphasizing the importance of early intervention and comprehensive management strategies to prevent long-term complications.

Keywords: *Giardia lamblia; Giardia duodenalis; Giardiasis intestinalis*; Protozoal Infection; Parasitic Infection

1. Introduction

Giardia lamblia (Giardia duodenalis or *Giardiasis intestinalis)* infection, also known as giardiasis, is a common intestinal parasitic infection worldwide, particularly prevalent in children from low or middle-income countries. The infection manifests with a range of clinical outcomes, from acute or chronic diarrhea to asymptomatic colonization, with potential long-term effects on intestinal permeability, nutrient absorption, and child growth [1,2,3]. Despite being a well-recognized disease, the pathogenesis remains partially understood, involving factors such as pro-inflammatory responses, gut microbiome alterations, and metabolic disruptions. Recent studies highlight the importance of this infection as a hidden threat to child health, contributing to malabsorption, chronic inflammation, and nutritional deficiencies, thereby stressing the need for comprehensive prevention and management strategies, especially in endemic areas with poor sanitation [4,5].

2. Material and methods

A literature exploration was performed using PubMed, ScienceDirect, and Google Scholar. The following meshwork of words was used individually or in combination: giardiasis, *Giardia lamblia, Giardia duodenalis, Giardiasis intestinalis,* symptoms, etiology, risk factors, pathophysiology, epidemiology, diagnosis, and treatment. The search is limited to peer-reviewed articles published within the last ten years and includes human research without language restrictions.

3. Results and discussion

Giardiasis is an enteric infection caused by the protozoan parasite *Giardia lamblia.* It is recognized as one of the most common intestinal parasitic infections worldwide, particularly affecting children and individuals in low-resource

* Corresponding author: Alpha Fardah Athiyyah

settings. Giardiasis has a worldwide distribution, affecting both temperate and tropical regions, and remains one of the most common intestinal parasitic infections globally. Prevalence rates vary widely, ranging from 4% to 42%, with higher rates in low-income countries. In industrialized nations, prevalence is lower, generally between 2% and 5%. Children, especially those under ten years old, are disproportionately affected, with prevalence rates reaching 15% to 20% in developing countries where giardiasis is a major cause of epidemic childhood diarrhea. The epidemiology of giardiasis in Indonesia reflects a significant public health concern, particularly among children in low-resource settings. Studies indicate that the prevalence varies by region, with rates ranging from 1.8% to as high as 28.9% in asymptomatic cases among school-aged children [1,6,7].

The life cycle of Giardia *lamblia* consists of two main stages: the trophozoite and the cyst. Infection begins when a host ingests environmentally resistant cysts through contaminated water, food, or direct contact with fecal matter. Upon reaching the stomach and small intestine, excystation occurs where each cyst releases two trophozoites. These trophozoites are motile, pear-shaped forms that attach to the intestinal mucosa using a ventral adhesive disk, multiply by binary fission, and cause symptoms of giardiasis. As trophozoites migrate towards the colon, they undergo encystation, forming cysts that are excreted in the feces. These cysts are hardy, can survive for weeks to months in moist environments, and are the infectious form that transmits the parasite to new hosts. The life cycle does not involve any intermediate hosts. The prepatent period typically ranges from 1 to 2 weeks after ingestion of cysts. Understanding this dual-stage cycle is essential for developing intervention strategies targeting both environmental contamination and direct infection control. The pathophysiology of giardiasis involves complex host-parasite interactions primarily in the small intestine, where the protozoan parasite *Giardia lamblia* adheres to the intestinal epithelium without invasion. The parasite disrupts the mucosal barrier by damaging the brush-border microvilli and impairing epithelial tight junctions, which leads to increased intestinal permeability and malabsorption. The trophozoites attach to enterocytes using surface proteins and secreted enzymes, such as cysteine proteases, which contribute to epithelial damage and inflammation. Giardiasis presents with a broad spectrum of clinical symptoms, ranging from asymptomatic carriage to severe gastrointestinal disturbances. Common symptoms reported in recent literature include diarrhea, which is often watery, foul-smelling, and greasy (steatorrhea), accompanied by abdominal pain or cramps, bloating, flatulence, nausea, and vomiting. Additional manifestations may include weight loss, malaise, decreased appetite, and fatigue. In children, giardiasis can lead to failure to thrive and impaired cognitive development due to malabsorption of nutrients. Chronic infection may result in persistent diarrhea and complications such as lactose intolerance, vitamin deficiencies, anemia, and irritable bowel syndrome. Individuals with compromised immune systems are at higher risk for experiencing more severe symptoms and complications. Fever is less commonly observed. The diverse symptom profile reflects the variable host responses and the parasite's impact on intestinal function [4,5,8,9].

Giardiasis is transmitted primarily via the fecal-oral route through ingestion of environmentally resistant cysts present in contaminated water, food, or through direct person-to-person contact. The cysts can survive for extended periods in the environment, especially in cold water, contributing to widespread transmission. Infections may also spread through contact with infected animals, highlighting the zoonotic potential of Giardia *lamblia*. Specific transmission pathways include consumption of untreated or contaminated drinking water, recreational water exposure, and ingestion of contaminated fresh produce. Additionally, poor personal hygiene, overcrowding, and inadequate sanitation infrastructure significantly increase transmission risk. Notably, sexual transmission has been reported among men who have sex with men via oral-anal contact. Risk factors for giardiasis include a range of socio-demographic, environmental, and host-related factors that influence susceptibility to infection. Predominantly in low-income countries, poor sanitation, inadequate personal hygiene, consumption of contaminated water and raw or unwashed fruits and vegetables are significant contributors. Children, especially those under five years old, are at increased risk due to immature immune systems and behaviors that facilitate ingestion of cysts. Immunocompromised individuals, such as those with HIV/AIDS or cancer, are more susceptible to severe or recurrent giardiasis. Additional risk factors include close contact with infected persons or animals, overcrowding, and attending daycare centers. International travel to endemic areas and exposure to contaminated recreational water are also linked to increased risk in developed countries. Seasonal variation affects infection rates, with higher occurrences in certain climates or during specific times of the year. Socio-economic status and maternal practices such as handwashing before feeding significantly affect infection risk, with lower awareness and resources correlating with higher prevalence [10,11,12].

The diagnosis of giardiasis traditionally relies on microscopic identification of Giardia trophozoites or cysts in stool samples, which remains the gold standard. Conventional wet mount microscopy allows visualization of motile trophozoites or cyst forms but requires immediate examination of fresh stool due to trophozoite fragility. Sensitivity is limited due to intermittent parasite shedding; hence, multiple stool samples (typically three collected over consecutive days) increase detection accuracy. Staining techniques, such as trichrome or iodine stains, enhance visualization. Stool antigen detection assays, such as enzyme-linked immunosorbent assay (ELISA) and immunochromatographic tests, have been increasingly adopted for their higher sensitivity and specificity compared to microscopy. ELISA has

demonstrated high sensitivity (up to 95-98%) and specificity (up to 100%) in detecting giardiasis. ELISA is also useful for large-scale epidemiological studies and monitoring treatment efficacy, though intermittent shedding of cysts and antigen variability may affect sensitivity. Immunochromatographic assays has sensitivities around 84-93% and specificities exceeding 99%. These tests are particularly useful in clinical settings requiring rapid diagnosis. While ELISA generally shows higher sensitivity compared to immunochromatographic tests, both enhance diagnostic accuracy compared to microscopy alone. Limitations include cross-reactivity with other intestinal parasites and variation in performance depending on the population being tested. Molecular methods, especially polymerase chain reaction (PCR) and nucleic acid amplification tests (NAATs), offer improved sensitivity and specificity and are capable of detecting low parasite loads, including asymptomatic infections. PCR techniques also allow genotyping and identification of different Giardia assemblages, which can have epidemiological and clinical significance. Polymerase chain reaction (PCR) has emerged as a highly sensitive and specific diagnostic method for detecting Giardia *lamblia* DNA in stool samples. Unlike traditional microscopy, PCR can identify the parasite even at low concentrations, such as 10 parasites per 100 microliters, enabling detection of both symptomatic and asymptomatic infections. Real-time PCR (qPCR) enhances this diagnostic capability by offering rapid, quantitative results and multiplexing potential to detect multiple pathogens in a single assay setup. Although PCR is more expensive and requires specialized equipment, its growing implementation in clinical laboratories has improved giardiasis diagnosis, particularly in outbreaks or high-risk populations. However, PCR is recommended as a complement, not a replacement, to microscopy and antigen tests, which remain essential for comprehensive diagnostic workup. The diagnosis of giardiasis using nucleic acid amplification tests (NAATs) relies on the detection of Giardia-specific DNA in stool samples, offering highly sensitive and specific results. NAATs provide advantages over traditional methods by overcoming intermittent cyst shedding and improving diagnostic accuracy, particularly in low-parasite-load samples. They are valuable in outbreak investigations, epidemiological surveillance, and environments requiring precise diagnostic confirmation [13,14,15].

The management of giardiasis primarily involves antimicrobial therapy aimed at eradicating the parasite. The first-line treatment widely recommended is metronidazole, typically administered at 250 to 500 mg orally three times daily for 5 to 10 days. Alternatively, tinidazole, which requires a single dose, is increasingly favored due to its convenience and similar efficacy. Other effective agents include nitazoxanide, albendazole, and paromomycin, especially in cases of metronidazole failure or resistance. Prevention of giardiasis focuses on interrupting transmission routes and reducing exposure to infectious cysts. Primary prevention strategies emphasize the importance of good personal hygiene, particularly thorough handwashing with soap and water after using the toilet and before handling food. Ensuring access to safe drinking water by boiling, chlorination, or using effective water filtration systems is critical for killing Giardia cysts. Proper washing of fruits and vegetables with treated water also reduces infection risk. Environmental control measures include wearing protective clothing during farm activities, controlling rodents and insects that can harbor cysts, and safe disposal of human and animal feces to prevent contamination of water and food sources. Secondary prevention involves prompt diagnosis and effective treatment to reduce cyst shedding and environmental contamination, often supported by mass drug administration in high-risk communities. Drugs commonly used include metronidazole, tinidazole, albendazole, and other nitroimidazoles. Tertiary prevention aims to manage complications through supportive care like nutritional supplementation and hydration therapy [1,16,17].

Complications of giardiasis can be diverse and potentially severe, especially when left untreated or in vulnerable populations such as children and immunocompromised individuals. The infection may lead to malabsorption syndrome causing weight loss and nutrient deficiencies, including disaccharidase deficiency, which impairs carbohydrate digestion. Growth retardation in children has been identified as a significant complication, even after symptomatic resolution. Research highlights critical early life periods, particularly the first two years, where exposure to Giardia can negatively affect language, motor skills, and socio-emotional development. The multifactorial nature of these deficits involves direct effects of the parasite on gut health, secondary nutritional deficiencies, and possibly neurotoxic microbial metabolites. These long-term consequences underscore the importance of early diagnosis and treatment to prevent growth faltering and cognitive impairment in children. Chronic or recurrent infection may contribute to the development of irritable bowel syndrome (IBS) and persistent gastrointestinal symptoms like bloating, abdominal pain, and diarrhea extending months to years post-infection. Reactive arthritis and food allergies have also been reported as extraintestinal manifestations [18, 19, 20].

4. Conclusion

Giardiasis is associated with various complications, especially when left untreated or in individuals with weakened immune systems. Common complications include malabsorption leading to weight loss, nutrient deficiencies, and growth retardation in children. Studies over the past 10 years have documented associations between Giardia infection and poor cognitive function, including lower intelligence quotients (IQ) and social quotients (SQ). The impairment in cognitive development may be mediated by altered intestinal permeability, nutrient malabsorption, and changes in gut

microbiota that affect key amino acids essential for brain development. Chronic infection can result in persistent diarrhea, dehydration, and electrolyte imbalances, increasing the risk of severe dehydration. In conclusion, giardiasis can lead to significant health issues if not diagnosed and treated promptly, emphasizing the importance of early intervention and comprehensive management strategies to prevent long-term complications.

Compliance with ethical standards

Disclosure of Conflict of interest

All authors equally contributed and acknowledge to read and approved the study.

References

[1] Dunn N, Juergens AL. Giardiasis [Internet]. PubMed. Treasure Island (FL): StatPearls Publishing; 2022. Available from: https://www.ncbi.nlm.nih.gov/books/NBK513239/

[2] Belkessa S, Ait-Salem E, Laatamna A, Houali K, Sönksen UW, Hakem A, et al. Prevalence and Clinical Manifestations of Giardia intestinalis and Other Intestinal Parasites in Children and Adults in Algeria. The American Journal of Tropical Medicine and Hygiene. 2021 Jan 18;3(104).

[3] Desai AN. Giardiasis. JAMA [Internet]. 2021 Apr 6 [cited 2021 Sep 20];325(13):1356. Available from: https://jamanetwork.com/journals/jama/fullarticle/2778110

[4] Gutiérrez L, Bartelt L. Current Understanding of Giardia lamblia and Pathogenesis of Stunting and Cognitive Deficits in Children from Low- and Middle-Income Countries. Current Tropical Medicine Reports. 2024 Jan 23;11(1):28–39.

[5] Zaidan Arifiansyah Bachtiar, Putri A, Yasin M, Rahmadany Isyaputri, Sukmawati Basuki. The Comparison of Giardia lamblia Infection and Nutritional Status of Elementary School Students in Mandangin Island, Sampang and Mojo Village, Surabaya, Indonesia. Biomolecular and Health Science Journal [Internet]. 2020 Oct 30;3(2):88. Available from: https://doi.org/10.20473/bhsj.v3i2.22406

[6] C K Jayaram Paniker, Sougata Ghosh. Paniker's textbook of medical parasitology. 8th ed. New Delhi: Jaypee/The Health Sciences Publisher; 2018.

[7] Harun H, Sennang N, Rusli B. GIARDIASIS. Healthy Tadulako Journal (Jurnal Kesehatan Tadulako) [Internet]. 2019 [cited 2023 Apr 5];5(3):4–12. Available from: https://doi.org/10.22487/htj.v5i3.125

[8] Robertson LJ, Hanevik K, Escobedo AA, Mørch K, Langeland N. Giardiasis – why do the symptoms sometimes never stop? Trends in Parasitology [Internet]. 2010 Feb;26(2):75–82. Available from: https://doi.org/10.1016/j.pt.2009.11.010

[9] Leung AKC, Leung AAM, Wong AHC, Sergi CM, Kam JKM. Giardiasis: An Overview. Recent patents on inflammation & allergy drug discovery. 2019;13(2):134–43.

[10] Alqeer Aliyo, Taye N, Girma Ashenafi. Giardia lamblia infections and associated risk factors among patients seeking stool examination at Bule Hora University Teaching Hospital, West Guji Zone, Ethiopia. Deleted Journal [Internet]. 2025 Jul 1 [cited 2025 Oct 31];14(3). Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC12374109/

[11] Dixon BR. Giardia duodenalis in humans and animals – Transmission and disease. Research in Veterinary Science. 2020 Sep;135(1).

[12] Krumrie S, Capewell P, Smith-Palmer A, Mellor D, Weir W, Alexander CL. A scoping review of risk factors and transmission routes associated with human giardiasis outbreaks in high-income settings. Current Research in Parasitology & Vector-Borne Diseases. 2022;2:100084.

[13] Soares R, Tasca T. Giardiasis: an update review on sensitivity and specificity of methods for laboratorial diagnosis. Journal of Microbiological Methods [Internet]. 2016 Oct 1;129:98–102. Available from: https://www.sciencedirect.com/science/article/pii/S016770121630224X?via%3Dihub

[14] Groudan K, Gupta K, Chalhoub J, Singhania R. Giardia lamblia Diagnosed Incidentally by Duodenal Biopsy. Journal of Investigative Medicine High Impact Case Reports. 2021 Jan;9:232470962110016.

[15] Giardiasis: Diagnosis, Pathogenesis and Treatment – International Journal of Health & Medical Research [Internet]. Ijhmr.com. 2024 [cited 2025 Oct 31]. Available from: https://ijhmr.com/giardiasis-diagnosis-pathogenesis-and-treatment/

[16] Peters TE, Kreuels B, Addo MM, Tannich E, Rothe C. Risk factors for and management of metronidazole-refractory giardiasis in international travellers: A retrospective analysis. Travel Medicine and Infectious Disease [Internet]. 2021 Sep 1 [cited 2021 Nov 25];43:102090. Available from: https://www.sciencedirect.com/science/article/pii/S1477893921001319

[17] Lalle M, Hanevik K. Treatment-refractory giardiasis: challenges and solutions. Infection and Drug Resistance [Internet]. 2018 Oct;Volume 11:1921–33. Available from: https://dx.doi.org/10.2147%2FIDR.S141468

[18] Naser SK. Giardiasis: A review study in Iraq. Al-Ameed Journal for Medical Research and Health Sciences. 2024 Jul 11;2(1).

[19] Allain T, Buret AG. Pathogenesis and post-infectious complications in giardiasis. Advances in Parasitology [Internet]. 2020 [cited 2021 May 20];107:173–99. Available from: https://pubmed.ncbi.nlm.nih.gov/32122529/

[20] Fekete E, Allain T, Siddiq A, Sosnowski O, Buret AG. Giardia spp. and the Gut Microbiota: Dangerous Liaisons. Frontiers in Microbiology. 2021 Jan 12;11.