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GIARDIASIS IN HUMAN

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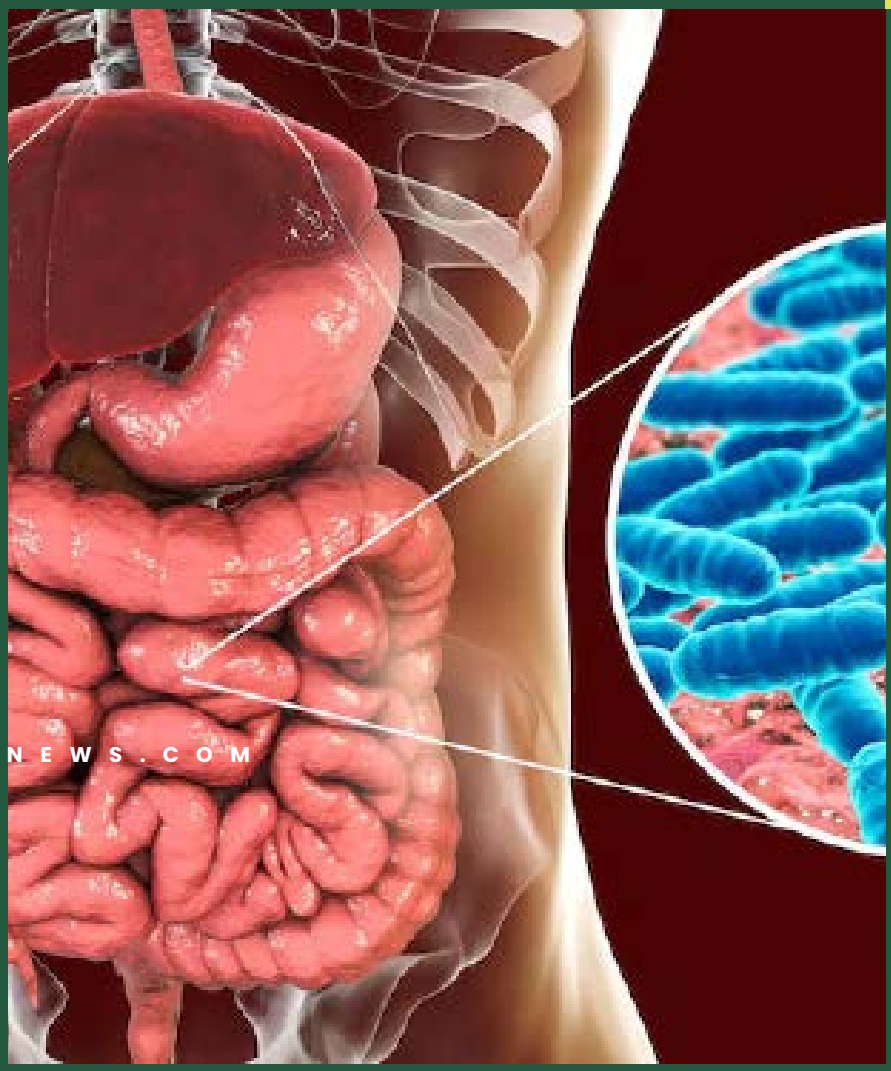

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ABOUT
- GIARDIASIS IN HUMAN

Abstract :

The flagellated protozoan pathogen, *Giardia* spp. remains a major contributor to the global burden of parasitic gastrointestinal illness. The risk of giardiasis is particularly elevated among preschool-aged children, daycare personnel, international travelers, the immuno-compromised, and the malnourished. The outbreak of giardiasis are mostly resulted from exposure to contaminated water and from close contact with diaper-wearing young children. Chronic giardiasis during childhood has been associated with intellectual deficits and additional developmental or health-related complications. Multiple diagnostic approaches, encompassing microscopic, immunological, and molecular techniques are available for the detection of *Giardia* infection.

Introduction :

Giardiasis is an infection of the gastro intestinal tract caused by the protozoan parasite *Giardia* spp. It is a common condition in areas with limited sanitation and healthcare infrastructure. Individuals affected by giardiasis frequently found with clinical signs like flatulence, abdominal discomfort, and watery diarrhea. *Giardia*, a flagellated protozoa acts as the most commonly found intestinal parasite and is regarded as the most prevalent protozoal intestinal-parasite globally. (Dun *et al.*, 2024).

It is known as “traveler’s disease” because it frequently affects people traveling abroad. Individuals involved in outdoor recreational activities, institutionalized individuals as well as child-care workers, are also at increased risk due to close-contact environments. *Giardia* infections are more common in children than adults of which 50 to 75% of the infected children remain asymptomatic while other children show acute or chronic diarrhoea (Leung *et al.*, 2019). Although some people show no symptoms, others may develop severe illness resulting in dehydration and significant weight loss.

Etiology :

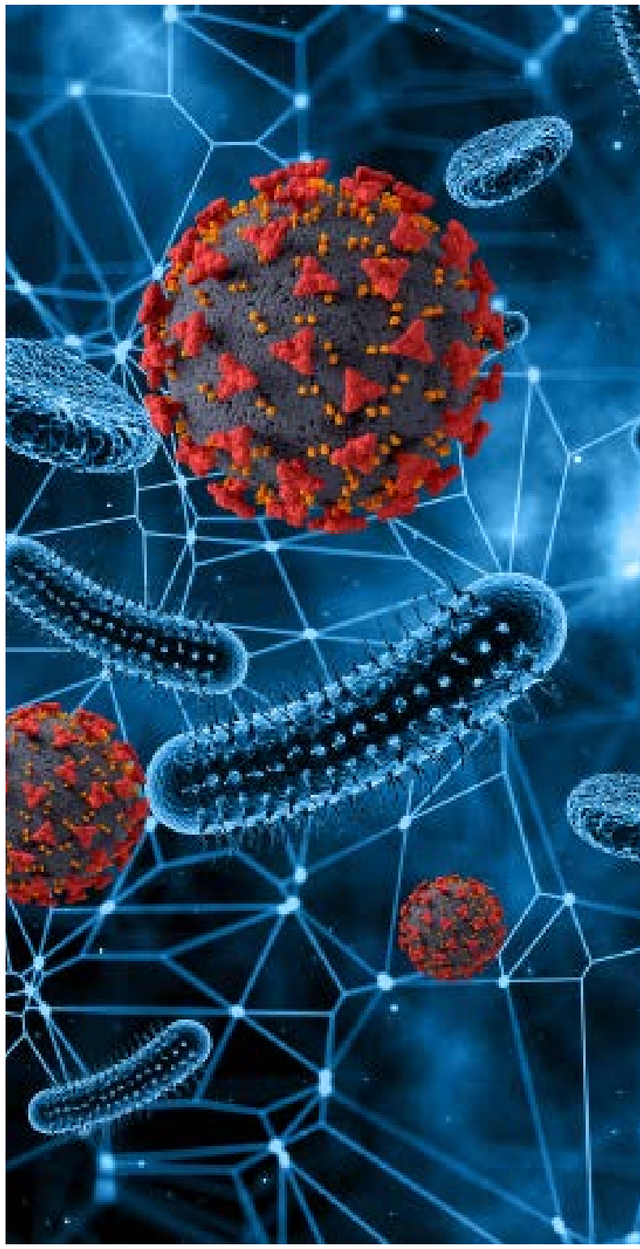
Giardiasis is primarily caused by the protozoan parasite *Giardia duodenalis* (also known as *G. lamblia or G. intestinalis*).

Humans acquire the infection by ingesting cysts through contaminated water or via direct person-to-person contact, with transmission strongly influenced by poor hygiene and inadequate sanitation. Daycare centers often serve as hotspots for infection due to insufficient handwashing practices, particularly during diaper changing and handling (Reses *et al.*, 2018). Once ingested, the cysts undergo excystation and differentiate into trophozoites.

Giardia species are pyriform to elliptical in shape with anterior end broader than posterior end. They are bilaterally symmetrical with dorsal side convex and a disc on the ventral side. The trophozoites possess two nuclei, a central axoneme (axostyle), two median bodies, and eight flagella arranged in four pairs.

Epidemiology :

Giardiasis represents the most common gastrointestinal protozoal infection globally, with prevalence estimates of about 2% in adults and 8% in children in developed nations. Children aged 0 to 4 years were the most affected group, with the largest percentage of cases being reported from the northwest US. Among children under 10, giardiasis is a leading cause of epidemic diarrhea, with prevalence rates as high as 15% to 20%.



Approximately 33% of the population in developingcountries has been infected with giardiasis reflecting the substantial burden of the disease in areas with limited sanitation. Giardiasis is widespread in both temperate and tropical climates, with prevalence estimates varying from 4% to 42%, depending on environmental and socioeconomic factors. In industrialized countries like United States, Japan, Germany, and France %. , giardiasis prevalence typically falls between 2% and 5%.

The estimated prevalence of giardiasis in India varies from 3.8% to 23.5% although most of these cases go unnoticed because carriers remain asymptomatic. A study in Assam found a 22.85 % prevalence in stool samples using molecular methods. . The incidence of giardiasis peaks in late summer and early fall, corresponding with heightened engagement in recreational water activities.

Pathophysiology :

The lifecycle of *Giardia* consists of 2 stages:

1. **Trophozoite:** This stage represents the parasite's active form, responsible for feeding and multiplying within the small intestine.
2. **Cyst :** This stage represents the parasite's dormant and environmentally resistant form facilitating transmission to new hosts.

No intermediate hosts are necessary for the completion of the *Giardia* life cycle. Upon ingesting water or food contaminated with cysts, these cysts enter the stomach and duodenum and undergo excystation triggered by exposure to hydrochloric acid and pancreatic enzymes. Within minutes of ingesting cysts, trophozoites begin to appear in the duodenum and start multiplying in

the small intestine. Upon reaching the large intestine, the parasite undergoes encystation in a neutral pH environment with secondary bile salts. The resulting cysts are shed into the environment, perpetuating the cycle. Trophozoites adhere to the intestinal epithelial surface via their ventral disc, causing damage to epithelial cells and reducing the activity of brush border enzymes. Consequently, infected patients might display altered gastrointestinal motility. The release of thiol proteinases and lectins by the parasite contributes to epithelial damage, resulting in increased intestinal permeability and reduced saccharide processing As a result, infected individuals may experience altered gastrointestinal motility, contributing to symptoms such as bloating and diarrheoa.

Clinical sign :

Approximately 50% of *Giardia*-infected individuals are asymptomatic, while symptomatic cases usually begin 1–2 weeks after exposure. Common symptoms consist of abdominal discomfort, nausea, and flatulence, along with bulky, watery, foul-smelling, greasy stools. Children may develop abdominal pain with mild diarrheoa, while frequent loose stools in other patients can lead to dehydration. Fever occurs infrequently, and in unusual cases, reactive arthritis may manifest with skin lesions and joint discomfort. While symptoms generally subside within a month, prolonged infection may result in weight loss and nutrient deficiency–related symptoms. Chronic giardiasis is marked by persistent diarrhea, weight loss, nausea, malaise, and anorexia. Post-infection lactase deficiency is also a common consequence, contributing to ongoing gastrointestinal discomfort.

Diagnosis :

Microscopy-based methods for the diagnosis of *Giardia* are widely used in routine laboratory testing, offering advantages such as the simultaneous detection of multiple parasites, low cost, and ease of implementation but the intermittent excretion of *Giardia* cysts substantially hinders reliable microscopic detection. Stool antigen detection using enzyme-linked immunosorbent assays (ELISAs) is also available which

are particularly useful for screening in high-incidence settings, such as during outbreaks or in daycare centers. Stool antigen detection assays are typically quicker, more sensitive, and more specific than microscopy. In the landscape of modern molecular diagnostics, DNA amplification techniques notably polymerase chain reaction (PCR) have emerged as particularly prominent, offering a highly promising result for *Giardia* detection, This method shows excellent sensitivity and specificity and enables direct identification of *Giardia* DNA in fecal samples. Real-time PCR is particularly effective in detecting mild and asymptomatic infections.

Treatment :

Antibiotic therapy remains the cornerstone of giardiasis management. Metronidazole is the most widely used agent, typically prescribed for 5–7 days. In adults, fixed-dose regimens are commonly used (e.g., 250 mg three times daily), whereas in children, weight-based dosing is employed, generally divided into three daily doses. Nevertheless, metronidazole has demonstrated failure rates of up to 40% in achieving complete parasite clearance. Nitroimidazole-refractory giardiasis is increasingly reported, particularly in travelers from India (Nabarro *et al.*, 2015). More recently, the Infectious Diseases Society of America (IDSA) has highlighted tinidazole and nitazoxanide as an alternative option for giardiasis treatment. Treatment is typically unnecessary for asymptomatic individuals, except when intervention is warranted to mitigate the risk of household transmission, notably from toddlers to expectant mothers. In such case, Paromomycin, with limited systemic bioavailability, may serve as a therapeutic option for managing giardiasis in pregnant mothers during the first trimester.

Conclusions :

Human giardiasis constitutes a major public health concern owing to its high global prevalence, marked environmental persistence, and capacity for transmission through a variety of reservoirs. The disease disproportionately affects vulnerable groups, particularly children and pregnant women. Microscopy remains the primary diagnostic method, highlighting the need for more sensitive and reliable techniques. Environmental factors, along with zoonotic transmission pathways, play a significant role in shaping the epidemiology of the disease. Strengthening public health education, enhancing routine surveillance, improving sanitation infrastructure, and investigating genetic diversity to inform targeted treatment strategies are recommended measures for effective control and management.

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