



Original Article



Frequency of Giardiasis in Children Presenting with Chronic Diarrhea

Muhammad Luqman Khan¹, Muhammadullah Hayat Ahmadzai¹, Momal Irshad¹, Sulaiman Khan² and Wajdan³¹Department of Pediatrics, Hayatabad Medical Complex, Peshawar, Pakistan²Department of Surgery, Northwest General Hospital and Research Centre, Peshawar, Pakistan³Department of Paediatrics, Combined Military Hospital, Peshawar, Pakistan

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Department of Paediatrics, Combined Military Hospital, Peshawar, Pakistan
wajdanshoab@gmail.comReceived Date: 30th July, 2025Revised Date: 2nd February, 2026Acceptance Date: 11th February, 2026Published Date: 30th April, 2026

ABSTRACT

Giardiasis, caused by *Giardia duodenalis*, is a common enteric protozoan infection in children, particularly in low-resource settings. It may present with chronic diarrhea, weight loss, and dehydration, though many infections remain asymptomatic. **Objectives:** To determine the frequency of giardiasis among children aged 1 to 5 years presenting with chronic diarrhea. **Methods:** This cross-sectional study was conducted in the Department of Paediatrics, Khyber Teaching Hospital, Peshawar, over six months. A total of 203 children with chronic diarrhea were enrolled using non-probability consecutive sampling. Stool samples were examined by direct microscopy with saline and Lugol's iodine staining, as well as formalin-ethyl acetate concentration. Giardiasis was diagnosed based on the presence of six or more cysts per coverslip at 40× magnification. Written informed consent was obtained from all parents/guardians. The study received ethical approval from the institutional review board (IRB Approval No: 935/DME/KMC). **Results:** Out of 203 children, 20 (9.9%) tested positive for *Giardia duodenalis*. No significant associations were found with age, gender, or weight. However, a statistically significant correlation was observed between giardiasis and duration of diarrhea. Children with symptoms lasting more than eight weeks had a higher prevalence (24.1%) compared to those with shorter duration (0.8%) ($p=0.001$). **Conclusions:** Prolonged diarrhea may be a clinical indicator of giardiasis in paediatric patients. Early detection and improved diagnostic methods are essential for timely treatment, especially in endemic areas with limited resources.

INTRODUCTION

Giardia duodenalis, sometimes referred to as *G. intestinalis* or *G. lamblia*, is the enteric protozoan that causes giardiasis. Flatulence and watery diarrhea are common symptoms, especially in children from low-resource homes. Cases are mostly documented among foreign visitors, outdoor explorers, and childcare providers in high-income nations like the US. Even while the illness is frequently asymptomatic, in those who do have symptoms, it can lead to serious morbidity, such as weight loss and dehydration. Nitroimidazole or other antiparasitic treatment usually works well and causes symptoms to go away quickly [1, 2]. The parasite spreads when cysts released by infected hosts contaminate water supplies. These cysts are long-lived in freshwater and immediately

become infectious upon excretion. Of the seven known genetic assemblages (A-G), only A and B are associated with human infection [3, 4]. Direct contact between people or the ingestion of contaminated water, particularly in unhygienic environments like daycare facilities, might facilitate the transmission of infection. When changing diapers, poor hand hygiene is one of the primary culprits in these situations. After consumption, the cysts excyst in the small intestine, releasing the pear-shaped, dual-nucleated motile trophozoites. Despite the wide variation in clinical presentation, over half of infected patients do not exhibit any symptoms. Within 1-2 weeks of infection, symptoms typically include gas, bloating, nausea, abdominal pain, and thick, greasy, foul-smelling feces. In addition to mild



diarrhea, children may experience stomachaches. Dehydration is common due to fluid loss. A study by Jethwa *et al.* found that 5% of kids with persistent diarrhea had a *Giardia* infection [5]. Mumtaz *et al.* however, discovered a prevalence of 25.3% in a similar cohort [6]. These discrepancies underscore the ongoing clinical and epidemiologic uncertainty regarding the role of *Giardia duodenalis* as a pathogenic cause of chronic diarrhea. Considering the disease's worldwide prevalence, this ambiguity is particularly serious. The World Health Organization (WHO) considers *Giardia* a neglected tropical illness, with an estimated 280 million infections per year and extended carriage in afflicted children, typically lasting more than six months [3]. The parasite is a chronic public health concern due to its environmental resilience, low infectious dosage (as little as 10 cysts), and dual transmission potential via people and animals [2, 6]. Foodborne outbreaks from contaminated seafood and leafy greens, clusters related to childcare, and seasonal surges associated with recreational water use have all been documented in resource-rich nations [3, 5]. Previous studies report highly variable prevalence of giardiasis in children with chronic diarrhea, and local data from Pakistani pediatric populations remain limited and inconsistent. In addition, many studies focus on acute diarrhea or asymptomatic infections rather than prolonged diarrheal cases and their clinical predictors. There is also insufficient evidence exploring the relationship between duration of diarrhea and confirmed Giardiasis using standardized diagnostic criteria. Therefore, this study addresses the need for region-specific data to clarify the frequency and clinical indicators of giardiasis among young children presenting with chronic diarrhea. This study aims to ascertain the prevalence of *Giardia duodenalis* infection in children who present with chronic diarrhea, taking into account the inconsistent epidemiological results and clinical ambiguity shown in previous investigations.

METHODS

This cross-sectional study was conducted at the Department of Paediatrics, Khyber Teaching Hospital in Peshawar. The study was conducted between November 1, 2024, and May 1, 2025. The study received ethical approval from the institutional review board (IRB Approval No: 935/DME/KMC). The study involved 203 children in total. With a 95% confidence interval, a 3% margin of error, and an expected frequency of giardiasis of 5% based on prior research, the sample size was calculated using the WHO sample size calculator. Rephrased scientifically. Every child who met the inclusion criteria during the study period was recruited until the required sample size was reached using non-probability, consecutive sampling. Written informed consent was obtained from all parents or

guardians of participating children before inclusion in the study. Particular inclusion and exclusion criteria were used in the selection of participants. Children of either gender, aged 1 to 5, who had chronic diarrhea defined as having stool frequency of ≥ 3 times per day sustained for ≥ 4 weeks, were eligible. A history of hepatitis, respiratory infections, lactose intolerance, or the inability to produce a stool sample for analysis were among the exclusion criteria. Enrolment was limited to children who met all inclusion requirements and none of the exclusion criteria. Data collection started in the outpatient department following ethical approval. All participating children's parents or guardians provided written informed consent. Age, gender, weight, and the length of diarrhea were among the baseline demographic data that were documented. Parents or guardians received instructions on how to properly collect stool samples. To ensure an adequate sample for analysis, parents of children under two years old were recommended to use the nappy in reverse to prevent absorption of the faecal matter. Youngsters over two were instructed on how to gather the sample in a sterile container. All samples were promptly delivered to the laboratory for microscopic examination. Light microscopy was used to examine stool samples using Lugol's iodine staining, and direct saline smears were performed. The presence of protozoan cysts was further confirmed using the formalin-ethyl acetate concentration technique. According to the operational criteria, which required six or more *Giardia* cysts per coverslip to be inspected at 40 \times magnification, Giardiasis was identified. On a specially created proforma, the results were recorded.

To analyse the data, IBM-SPSS version 20 was used. Frequencies and percentages were used to represent categorical characteristics like gender and Giardiasis presence. Means and standard deviations were used to analyse quantitative data such as age, weight, and length of diarrhea. To evaluate any correlations or patterns within subgroups, giardiasis was stratified by age, gender, and length of diarrhea.

RESULTS

A total of 203 children with chronic diarrhea who were between the ages of 1 and 5 were included in this study. Participants' average diarrhea length was 8.02 ± 2.18 weeks, and their average age was 2.76 ± 1.01 years. The recorded mean weight was 11.11 ± 1.55 kg. Of the patients who were enrolled, 72 (35.5%) were female, and 131 (64.5%) were male. Twenty (9.9%) of the 203 patients had a *Giardia duodenalis* infection, whereas 183 (90.1%) did not have the parasite. Despite the fact that females had a higher percentage of giardiasis (11.1%) than males (9.2%), this difference was not statistically significant ($p=0.655$) (Table 1).

Table 1: Demographic Characteristics and Frequency of Giardiasis(n=203)

Variables	Mean ± SD / n (%)
Age (years)	2.76 ± 1.01
Duration of Diarrhea (weeks)	8.02 ± 2.18
Weight (kg)	11.11 ± 1.55
Gender (Male)	131 (64.5%)
Gender (Female)	72 (35.5%)
Giardiasis Positive	20 (9.9%)
Giardiasis Negative	183 (90.1%)

Giardiasis was slightly more common in children older than 3 years (14.3%) than in those younger than 3 years (8.7%), although the difference was not statistically significant ($p=0.279$). With a positive rate of 11.3% in children weighing more than 10 kg and 7.6% in those weighing less than 10 kg ($p=0.389$), weight-based stratification likewise did not reveal any significant correlation (Table 2).

Table 2: Stratification of Giardiasis by Demographic Variables

Variables	Subgroup	Giardiasis (+)	Giardiasis (-)	p-value
Age	1-3 Years	14 (8.7%)	147 (91.3%)	0.279
	>3 Years	6 (14.3%)	36 (85.7%)	
Gender	Male	12 (9.2%)	119 (90.8%)	0.655
	Female	8 (11.1%)	64 (88.9%)	
Weight	≤10 kg	6 (7.6%)	73 (92.4%)	0.389
	>10 kg	14 (11.3%)	110 (88.7%)	

Nonetheless, a statistically significant correlation between the length of diarrhea and giardiasis was discovered. Giardiasis was much more common in children whose diarrhea lasted longer than 8 weeks (24.1%) than in those whose diarrhea lasted between 4 and 8 weeks (0.8%) ($p>0.001$). This implies that lengthier diarrheal episodes could be a significant sign of a paediatric *Giardia* infection. These findings emphasize the need to consider giardiasis in children presenting with prolonged diarrhea, even in the absence of significant weight or age-related trends (Table 3).

Table 3: Stratification of Giardiasis by Duration of Diarrhea

Duration of Diarrhea	Giardiasis (+)	Giardiasis (-)	p-value
4-8 Weeks	1 (0.8%)	123 (99.2%)	<0.001
>8 Weeks	19 (24.1%)	60 (75.9%)	

DISCUSSION

Children with chronic diarrhea have a significant prevalence of *Giardia duodenalis* infection, according to this cross-sectional study, highlighting the pathophysiology of chronic gastrointestinal illness in this population. After three weeks of treatment, a considerable proportion of patients were still infected even though metronidazole was administered at the recommended dosage for children. Several reasons could be responsible

for this treatment failure, such as the quick reinfection brought on by close contact with other infected people in hospital settings [7] or the compromised immune responses frequently seen in undernourished children with chronic diarrhea and protein-energy malnutrition [8]. Indeed, prior research has documented recurring or persistent giardiasis in immunocompromised persons, especially those with weakened cell-mediated immunity [9]. Half of the children in our cohort who tested positive for giardiasis were not underweight, despite the fact that malnutrition is known to be a contributing factor to chronic giardiasis. However, several host defenses, including the release of stomach acid, can be compromised by starvation. Giardiasis is frequently linked to conditions like hypochlorhydria and achlorhydria, which can promote both the original infection and reinfection [10]. *Helicobacter pylori* co-infection, which is known to lower stomach acid levels and may lead to persistence or reinfection with *Giardia*, has also been linked to giardiasis [11, 12]. More research is necessary to determine whether eliminating *H. pylori* could lower the risk of giardiasis recurrence. Diagnostic methods and population selection have an impact on the variation in the background prevalence of giardiasis among children in low-resource settings who do not exhibit symptoms. Higher dosages or longer treatment periods, such as 35 mg/kg/day for 10 days, would have been more beneficial even though we followed a typical metronidazole protocol. To improve outcomes for children with chronic giardiasis, it is important to investigate the effectiveness of an initial eradication strategy and the possible advantages of retreatment following nutritional rehabilitation. *Giardia* is endemic in many low-income areas, and almost all children are exposed to it, but not all of them develop symptoms [13]. Only the first infections in babies or children who have just been exposed (such as creche participants or tourists) usually cause acute diarrhea, whereas reinfections are usually asymptomatic because of partial immunity. However, persistent and severe forms of giardiasis are more common in malnourished children, especially those with underlying nutritional deficits [14]. Stunted growth, poor cognitive development, and severe nutritional status worsening can result from these infections [15-17]. *Giardia* trophozoites cause chronic intestinal injury and enduring symptoms by damaging villi, upsetting the intestinal epithelium, and possibly avoiding immune clearance through antigenic variation [18, 19]. Specific immunological weaknesses, including hypogammaglobulinemia, are significantly linked to chronic infection, even though overall immunosuppression does not always increase susceptibility, as demonstrated by its relatively low occurrence in HIV or chemotherapy patients [20]. Young children's adaptive immune system immaturity is probably

a major contributing cause to the greater incidence of Giardiasis symptoms following initial exposure.

Future studies should include multicenter designs with larger sample sizes and incorporate advanced diagnostic methods such as antigen detection or PCR to improve accuracy. Longitudinal research is also recommended to evaluate treatment outcomes, reinfection rates, and the role of nutritional status in chronic giardiasis among children. There are several restrictions on this study. The results might not apply to larger populations because the study was conducted at a single location and had a small sample size. Selection bias may be introduced when non-probability sampling is used. Furthermore, compared to more sophisticated molecular approaches, the sensitivity of relying solely on microscopy for diagnosis may be limited.

CONCLUSIONS

The study found a high prevalence of *Giardia duodenalis* in children with chronic diarrhea lasting over eight weeks. Diarrhea duration was a key indicator, while age, gender, and weight showed no significant correlation. Metronidazole often failed to fully clear the infection, possibly due to reinfection or immune issues in underweight children. Early diagnosis and improved treatment strategies are critical in endemic, resource-limited areas.

Authors' Contribution

Conceptualization: MHA

Methodology: MHA, W

Formal analysis: MHA, W

Writing and Drafting: MLK, MHA, MI, SK, W

Review and Editing: MLK, MHA, MI, SK, W

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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