JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 11, November 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

PREVALENCE AND CLINICAL IMPACT OF INTESTINAL PARASITES IN CHILDREN WITH POST-DIARRHEAL SYNDROME

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ABSTRACT: Objective: This study aims to determine the frequency of concomitant parasitic infections in children under three years of age who suffered from acute diarrhea 3 to 6 months prior, and to assess the role of parasitosis in the manifestation of Post-Diarrheal Syndrome (pDS). Methods: A total of 151 children aged under 3 years with a history of acute diarrhea were examined. Triple coproscopy was utilized for qualitative parasitological analysis. Clinical symptoms were monitored and compared between parasitic and non-parasitic groups. Results: Intestinal parasites were detected in 72.8% (n=110) of the subjects. The dominant species were Enterobius vermicularis (39.1%), followed by Blastocystis hominis (25.2%) and Giardia lamblia (18.5%). Co-infections (polyinvasion) were observed in 27.8% of cases, primarily helminth-fungal associations. Specific clinical correlations were identified: Blastocystis was significantly associated with dyspeptic disorders ($p<0.01$), while Enterobius was linked to neurological symptoms ($p<0.05$). Conclusion: Parasitic infections are highly prevalent in children with PDS and significantly exacerbate clinical symptoms, particularly affecting the gastrointestinal and nervous systems.

Keywords: Post-Diarrheal Syndrome (pDS), Intestinal Parasites, Children, Enterobius vermicularis, Blastocystis hominis, Giardia lamblia, Dyspepsia, Neuro-reflex disorders, Candida.

INTRODUCTION

Post-Diarrheal Syndrome (pDS) in young children remains a significant challenge in pediatric gastroenterology. Parasites residing in the intestine for prolonged periods, along with their metabolic byproducts, induce subatrophic and total atrophic changes in the mucosal lining. These pathogens exert a direct cytopathic effect on the intestinal wall tissue, leading to the development of malabsorption syndrome, severe nutritional status impairment, and disruption of digestion and microbiocenosis processes.

Furthermore, parasitic infections contribute to a reduction in immune defense mechanisms, impaired epithelial regeneration, and increased intestinal permeability to large molecular antigens, which sensitize the body. Consequently, a syndrome of chronic internal intoxication is established (Borzunov et al., 2004; Kvasova & Bugero, 2005).

Despite existing research, the specific correlation between the type of parasitic invasion and the clinical nuances of PDS in children under three years of age requires further elucidation. This study focuses on identifying the frequency of these parasites and their impact on the clinical course of PDS.

METHODS

Study design and participants - This observational study involved 151 children aged under three years. The inclusion criteria required a documented history of acute diarrhea occurring 3 to 6

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months prior to the current examination. The study was conducted at the Andijan Regional Infectious Diseases Hospital and associated clinics in Uzbekistan.

Data collection - An outpatient card was developed for each participant. The demographic data, clinical history, and current symptomatology were recorded. The average age of the children was 1.95\pm 0.7 years.

Parasitological examination - To detect intestinal parasites, qualitative parasitological examination of feces was performed using the triple coproscopy method. Stool samples were collected using a preservative (Turdieva's method). Infection intensity was estimated using a standard quantitative assessment in the field of view (ocular x10, objective x40) (Borzunov et al., 2004; Potaturkina-Nesterova et al., 2003).

Statistical analysis - statistical analysis was performed to compare frequencies and clinical manifestations. Differences between groups were assessed, with significance thresholds set at $p<0.05$ and $p<0.001$.

RESULTS

Demographic and prevalence data - Among the 151 children examined, boys significantly outnumbered girls (91 boys [60.3%] vs. 60 girls [39.7%]; $P<0.001$). Parasitic infection was confirmed in 110 children, representing a prevalence rate of 72.8%. Only 41 children (27.2%) were free of parasites.

Spectrum of parasitic infections - The distribution of identified parasites was as follows. *Enterobius vermicularis* was the most common, followed by *Blastocystis hominis* and *Giardia lamblia*.

Table 1. Results of parasitological examination of children with PDS (n=151)

Type of Parasites	**Abs.**	**%**
Giardia lamblia	12	7.9
Enterobius vermicularis	31	20.5
Blastocystis hominis (6-5 in field of view)	25	16.6
Giardia lamblia + *Enterobius vermicularis*	2	1.3
Blastocystis hominis + *Enterobius vermicularis*	8	5.3
Candida sp. + *Enterobius vermicularis*	19	12.6
Candida sp. + *Giardia lamblia*	6	4.0
Candida sp. + *Blastocystis hominis*	5	3.3
Giardia lamblia + *Enterobius vermicularis* + *Candida* sp.	2	1.3
Total Protozoa (Pathogenic)	**60**	**39.7**
Total Helminths	**59**	**39.1**
Total Patients with Pathogenic Parasites	**110**	**72.8**
Patients without Parasitosis	**41**	**27.2**

Polyinvasion (co-infection) was identified in 27.8% of parasitic cases. The most common association was fungal-helminth infection (*Candida* + *Enterobius vermicularis*), accounting for 12.6% of the total cohort. Interestingly, no protozoan-protozoan associations were observed. *Blastocystis hominis* was never found in association with *Giardia lamblia*.

Clinical features by parasite type - The study identified distinct clinical profiles based on the type of parasite. The frequency of parental complaints varied significantly depending on the type of

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parasitic invasion.

Table 2. Frequency of complaints from parents of children with PDS with and without concomitant parasitosis (n=151)

Complaints	**Non-parasitic (n=41)**	**Blastocystosis (n=30)**	**Enterobiasis (n=50)**	**Giardiasis (n=18)**	**Helminth+ Protozoa (n=12)**
	Abs (%)	**Abs (%)**	**Abs (%)**	**Abs (%)**	**Abs (%)**
Weakness	19 (46.3)	10 (33.3)	34 (68.0)	9 (50.0)	9 (75.0)
Reduced appetite	21 (51.2)	23 (76.7)	33 (66.0)	9 (50.0)	10 (83.3)
Moodiness / Whining	21 (51.2)	12 (40.0)	26 (54.0)	14 (77.8)	10 (83.3)
Sleep disturbance	3 (7.3)	-	11 (22.0)	1 (5.6)	3 (25.0)
Headache	15 (36.6)	6 (20.0)	24 (48.0)	7 (38.9)	6 (50.0)
Weight loss	7 (17.1)	12 (40.0)	7 (14.0)	4 (22.2)	5 (41.7)
Frequent colds	12 (29.3)	16 (53.3)	18 (36.0)	11 (61.1)	8 (66.7)
Allergic rashes	2 (4.9)	-	3 (6.0)	5 (27.8)	4 (33.3)
Stool disorders	23 (56.1)	26 (86.7)**	25 (52.0)	10 (55.6)	10 (83.3)
Abdominal pain	23 (56.1)	16 (53.3)	31 (62.0)	11 (61.1)	9 (75.0)
Teeth grinding (Bruxism)	2 (4.9)	-	13 (26.0)**	2 (11.1)	3 (25.0)
Twitching	1 (2.4)	-	5 (10.0)	1 (5.6)	2 (16.7)
Anal itching	9 (21.9)	3 (10.0)	11 (22.0)	2 (11.1)	3 (25.0)
Cheilitis	3 (7.3)	-	9 (18.0)	2 (11.1)	2 (16.7)
Rumbling in abdomen	7 (17.1)	2 (6.7)	9 (18.0)	3 (16.7)	3 (25.0)
Stool instability	8 (19.5)	2 (6.7)	12 (24.0)	9 (50.0)	7 (58.3)
No complaints	**7 (17.1)**	**9 (30.0)**	**4 (8.0)**	**1 (5.6)**	**-**

Note: (**) Indicates statistically significant difference compared to non-parasitic indicators.

Key clinical findings from tables: 1) Blastocystosis - Significantly associated with dyspeptic symptoms. Stool disorders were reported in 86.7% of cases ($P<0.01$). Weight loss was frequent (40%), but nervous system disorders were not characteristic of this group. 2) Enterobiasis - Characterized by neurological symptoms. Weakness (68%), moodiness/whining (54%), headache (48%), and sleep disturbances (22%) were significantly more common than in non-parasitic cases ($P<0.05$). 3) Giardiasis - Associated with abdominal pain syndrome, reduced appetite, and alternating constipation and diarrhea. Allergic manifestations were also noted. 4) Mixed Infections - Children with mixed infections (e.g., *Giardia* + *Enterobius*) exhibited the highest frequency of all clinical symptoms, significantly exceeding those in mono-infected or non-infected groups.

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DISCUSSION

The findings of this study reveal a critically high prevalence (72.8%) of intestinal parasites among children suffering from Post-Diarrheal Syndrome (pDS). This suggests that the "recovery" phase following acute diarrhea is often compromised by opportunistic parasitic invasions, which exploit the weakened mucosal defenses. The dominance of Enterobius vermicularis (39.1%) and Blastocystis hominis (25.2%) indicates that these pathogens are not merely bystanders but active contributors to the chronic morbidity seen in PDS.

A significant observation in our research is the distinct pathophysiological mechanisms suggested by the clinical presentations. In cases of Blastocystis hominis, the strong correlation with dyspeptic disorders (86.7%) and weight loss implies a direct interference with digestive processes. Literature suggests that pathogenic concentrations of Blastocystis (5-6 per field of view) can inhibit parietal digestion and increase chyme acidity. This acidification likely disrupts the enzymatic environment necessary for nutrient absorption, creating a cycle of malabsorption and continued diarrhea.

Conversely, Enterobius vermicularis presented a predominantly neuro-reflexive clinical picture. The statistical prevalence of weakness, moodiness, and sleep disturbances in this group supports the hypothesis that enterobiasis exerts a systemic toxic effect. The mechanism likely involves both the physical irritation causing sleep deprivation (nocturnal pruritus) and the absorption of metabolic toxins through the compromised intestinal barrier, leading to chronic intoxication of the developing nervous system.

Furthermore, the study highlighted the role of polyinvasions, particularly fungal-helminth associations (Candida + Enterobius), which accounted for a significant portion of mixed infections. This suggests that the post-diarrheal gut microbiome is in a state of severe dysbiosis, where fungal overgrowth co-exists with parasitic infection. The absence of significant clinical severity in the non-parasitic PDS group reinforces the conclusion that the persistence of PDS symptoms—ranging from allergic rashes to behavioral changes—is largely driven by the sensitizing and toxic effects of these unaddressed parasitic infections.

CONCLUSION

Based on the comprehensive analysis of clinical and parasitological data, the following conclusions are drawn:

High Prevalence: Intestinal parasitosis is a fundamental characteristic of children presenting with Post-Diarrheal Syndrome. The study confirmed that nearly three-quarters of affected children harbor parasites, with Enterobius vermicularis being the most frequent pathogen, followed closely by Blastocystis hominis.

Complex Co-infections: There is a notable prevalence of mixed infections, specifically helminth-fungal associations. This indicates that PDS is often a multifactorial condition involving both parasitic invasion and fungal dysbiosis, which requires a complex therapeutic approach.

Pathogen-Specific Clinical Impact: Parasitic infections significantly diversify the clinical course of PDS. Blastocystis hominis is the primary driver of prolonged gastrointestinal dysfunction and weight loss, whereas Enterobius vermicularis is responsible for profound neurological and astheno-vegetative symptoms.

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Systemic Sensitization: The presence of parasites correlates with allergic manifestations and chronic intoxication, confirming that these pathogens maintain a state of hypersensitivity in the child's body, delaying recovery.
Clinical Recommendation: The management of Post-Diarrheal Syndrome must extend beyond standard rehydration and dietary measures. Mandatory screening for intestinal parasites and fungi is essential. Targeted deworming and antifungal therapies should be considered integral components of the rehabilitation protocol for children recovering from acute diarrhea.

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