

## Prevalence of Intestinal Parasitic Infections Detected in Stool Samples: A Retrospective Study

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### Abstract:

**Background:** Intestinal parasitic infections (IPI) remain a major public health problem in developing countries due to poor sanitation, unsafe water, and inadequate hygiene. These infections cause significant morbidity, particularly among children and immuno-compromised individuals.**Aim:** To determine the prevalence and distribution of intestinal parasitic infections detected in stool samples at a tertiary care hospital in Bihar.**Methodology:** A hospital-based retrospective descriptive study was conducted in the Department of Microbiology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India over 6 months. A total of 144 stool samples were examined using macroscopic and microscopic methods including saline, iodine wet mounts, and modified Ziehl-Neelsen staining. Data were analyzed using descriptive statistics.**Results:** Overall prevalence was 28.5% (41/144). Infection was slightly higher in males (30.5%) than females (25.8%). Highest positivity occurred in 51–60 years (33.3%) and 0–10 years (30.7%). Protozoa predominated (65.9%), mainly *Entamoeba histolytica* (12.5%) and *Giardia lamblia* (6.3%). Helminths accounted for 31.7%, chiefly *Ascaris lumbricoides* (3.5%) and hookworm (2.8%). Detection was highest in loose stools (38.5%).**Conclusion:** Intestinal parasitic infections remain common, with protozoa predominating. Improved sanitation, hygiene awareness, and routine stool examination are essential for control.**Keywords:** Intestinal Parasitic Infections, Prevalence, Stool Examination, Protozoa, Helminths, Retrospective Study.

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### Introduction

Intestinal parasitic infection (IPI) is one of the most relevant, but still unaddressed, issues of public health in the economically underdeveloped countries. These infections have remained rife among the susceptible groups, especially those residing in neighborhoods with poor sanitation, lack of access to clean drinking water, and poor hygiene habits. [1]. The burden of disease is greater in low and middle-income countries where environmental, socio-economic and behavioral conditions promote transmission and persistence of parasites in society. Although medical advances have been made in the present-day world, coupled with preventive care, intestinal parasitosis still enhances morbidity, slowed growth, and low productivity, particularly in children and immuno-compromised patients.

Protozoan and helminthic parasites responsible of intestinal infections are a wide range. The most

prevalently reported are *Ascaris lumbricoides*, *Entamoeba histolytica*, *Toxoplasma gondii*, *Cyclospora* species, *Giardia lamblia*, and *Cryptosporidium* species. [2] These are diverse in their morphology, life cycle, pathogenicity, and clinical presentation. Protozoa (such as *Entamoeba histolytica*) and helminths (such as *Ascaris lumbricoides*) can cause invasive intestinal disease and extra-intestinal complications, respectively, while protozoa (such as *Entamoeba histolytica*) are the primary cause of chronic nutritional deficiencies. Opportunistic parasites like *Cryptosporidium* species tend to cause dire sickness in immunocompromised hosts and young children, which adds a lot of morbidity in diarrhea.

Intestinal parasites are transmitted majorly by the fecal-oral route. Pollution of land, water and food is a key factor to perpetuate the chain of transmission especially in areas which lack sanitation facilities and

proper waste disposal methods. Improper waste disposal, open air usage, absence of hand hygiene and eating of untouched vegetables also put them at a high risk of developing infection. Infective stages of parasites remain in the environment also increasing their propagation in a highly populated region. The risk of infection is much greater in rural and peri-urban areas where contact with polluted soil and unregulated sources of water is often encountered. [2]

Intestinal parasitic diseases have become a significant burden of disease globally. The level of soil-transmitted helminths has been estimated to be about 1.5 billion individuals in the world. The prevalence of infection has been strictly linked with poverty, overcrowding, absence of environmental sanitation and ignorance about good hygienic behavior. The infections are most common at tropical and subtropical locations such as the sub-Saharan Africa, some parts of America, China and East Asia. [3]. The moist and hot climatic conditions enable the survival and development of parasitic eggs and larvae and therefore, continue to transmit the endemic.

India is one of the nations where intestinal parasites infections are still endemic and geographically varied. The geographical location distribution and prevalence of certain parasites are determined by climatic factors, way of life, and sanitation facilities. There is a wide range of parasitic association which is seen in various parts of India. Hookworm infections are reported more in South India than *Trichuris trichiura* and *Ascaris lumbricoides*. [4]. The differences are due to variations in agricultural practices, walking habits when barefoot and the type of soil. This variability underscores the need to consider epidemiological studies that are region-specific in order to have a good control strategy.

Some parasites of the intestine are commonly chronic, insidious and cause long-term effects and not acute serious disease. Infected patients can take long before showing any symptoms hence acting as a reservoir of the infection. But chronic infection can cause numerous health problems. Parasitic infections are highly linked to malnutrition, retarded growth, and physical development in children. Helminthic infection causes chronic blood loss which causes iron deficiency anemia, and protozoa infections cause malabsorption which causes vitamin deficiencies. Such nutritional deficiencies cause low performance at school, lack of concentration, and cognitive impairment. [5]. Chronic infections in adults can diminish work capacity and productivity thus ending the poverty and disease cycle.

Intestinal parasites cause considerable morbidity of the gastrointestinal system and have not just nutritional and developmental effects. The symptoms can be abdominal pain, diarrhea, dysentery, nausea, and weight loss. In extreme situations, intestinal obstruction, hepatic abscess and chronic inflammatory

conditions can be developed. Immunocompromised people have more severe disease burden since opportunistic parasites can lead to life-threatening and chronic infections. The combined effect of these infections on the health systems of populations is significant especially in the ones where there are insufficient resources in terms of diagnostic facilities and preventive measures.

Prevalence should be correctly estimated to plan and control effective control programs and evaluate the interventions of public health. The epidemiological studies that are based in community offer the most representative data on the disease burden, but this needs huge resources and logistics. The studies conducted in hospitals, although they do not represent the whole population, still present useful information about the patterns of the infection, demographic distribution, and temporal patterns. They assist in the detection of the usually seen parasites and to some degree, they act as a marker of the community transmission. [5]. Back examination of stool samples that have been taken in hospital labs provides a viable and economical method of establishing prevalence and informative preventive measures.

Diagnosis at an early stage is important in the reduction of morbidity and transmission prevention. The analysis of stool is still the basis that detects intestinal parasites. Ova, cysts, as well as trophozoites may be identified under a microscope and allow one to confirm that one is infected and conduct adequate treatment. Frequent monitoring based on laboratory records can show the trend of prevalence of the infection, changes by season, and the high-risk population. Such data are especially relevant in the endemic areas where vast populations rely on the public healthcare institutions to diagnose and treat them.

Given the ongoing epidemiological burden of intestinal parasitic infections and their effects on human health, there is a constant necessity of epidemiological surveillance. The knowledge of how the prevalence is taking place in certain geographical areas assists the policymakers to develop deworming programs, sanitation campaigns and health education programs. Further on, when the dominance of parasites in an area is identified, it helps clinicians to choose the most suitable empirical treatment and preventive options.

Consequently, the given retrospective study was conducted to find out the percentage of intestinal parasitic infections identified in stool samples in patients visiting a hospital in Bihar. The results of the proposed research will serve as an addition to available epidemiological data and aid in the creation of the effective prevention and control strategies of the intestinal parasitic infections in the area.

#### Methodology

**Study Design:** This study was a hospital-based retrospective descriptive study conducted to determine the prevalence of intestinal parasitic infections detected in stool samples received in the microbiology laboratory.

**Study Area:** The study was carried out in the Department of Microbiology, Darbhanga Medical College and Hospital (DMCH), Laheriasarai, Darbhanga, Bihar, India.

**Study Duration:** The study covered a period of 6 months from April 2025 to September 2025. Laboratory records of stool samples received during this period were reviewed and analyzed retrospectively.

**Sample Size:** Total number of stool samples analyzed: 144.

**Study Population:** The study population included all patients (both outpatients and inpatients) of any age and gender whose stool samples were sent to the microbiology laboratory for parasitological examination based on clinical suspicion of gastrointestinal infection.

**Data Collection:** Data were collected retrospectively from the laboratory records maintained in the Department of Microbiology, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar. The stool examination registers were reviewed for a period of six months and relevant information was extracted. The collected details included age and gender of the patient, source of sample (outpatient or inpatient), date of submission, macroscopic findings, microscopic findings, and type of parasite detected. Each record was carefully screened to avoid duplication and incomplete entries were excluded from the analysis. The collected data were compiled systematically in a pre-designed data sheet for further evaluation.

**Laboratory Procedure:** All stool samples received in the laboratory during the study period were processed according to standard microbiological procedures. Initially, macroscopic examination was performed to observe color, consistency, and the presence of mucus, blood, adult worms, or segments of parasites. This was followed by microscopic examination using direct wet mount preparations. Normal saline mount was used to detect motile trophozoites, larvae, and helminthic ova, while Lugol's iodine mount was used for better visualization of cysts and ova. Whenever clinically indicated, Modified Ziehl-Neelsen staining was performed for the detection of coccidian parasites such as *Cryptosporidium*, *Cyclospora*, and *Isospora*. The results obtained from

microscopy were recorded in the laboratory register and used for analysis.

#### Inclusion Criteria

- All stool samples received in the microbiology laboratory during the study period
- Samples from patients of all age groups and both sexes
- Samples submitted for routine parasitological examination

#### Exclusion Criteria

- Duplicate samples from the same patient showing identical results
- Improperly labeled samples
- Inadequate quantity of stool
- Dried or contaminated samples unsuitable for examination

**Procedure:** The laboratory records of stool examinations conducted during the six-months study period were reviewed and relevant data were extracted. Each sample was evaluated for the presence or absence of intestinal parasites and categorized accordingly. The identified parasites were grouped into protozoa and helminths. Duplicate reports from the same patient were removed to prevent bias. The prevalence of intestinal parasitic infections was calculated by dividing the number of positive samples by the total number of samples examined and expressing the result as a percentage.

**Statistical Analysis:** All collected data were entered into Microsoft Excel for analysis. Descriptive statistical methods were applied to summarize the findings. The results were expressed in terms of frequency and percentage distributions. Tables and figures were prepared to demonstrate the prevalence of intestinal parasitic infections and their distribution according to demographic variables".

#### Result

Table 1 depicts the age-wise distribution of intestinal parasitic infections (IPI) among 144 participants. The overall positivity was 41 cases (28.5%). The highest prevalence was observed in the 51–60 years age group with 6 cases (33.3%), followed by 0–10 years with 8 cases (30.7%) and 21–30 years with 7 cases (29.2%). Moderate positivity was seen in 11–20 years (5; 27.8%) and 31–40 years (6; 27.3%), while lower prevalence occurred in 41–50 years (5; 25.0%) and >60 years (4; 25.0%). Overall, infection was distributed across all age groups with slightly higher occurrence in middle-aged and younger individuals.

| Age group (years) | Total samples examined | No. positive for IPI (%) |
|-------------------|------------------------|--------------------------|
| 0–10              | 26                     | 8 (30.7%)                |
| 11–20             | 18                     | 5 (27.8%)                |
| 21–30             | 24                     | 7 (29.2%)                |
| 31–40             | 22                     | 6 (27.3%)                |
| 41–50             | 20                     | 5 (25.0%)                |
| 51–60             | 18                     | 6 (33.3%)                |
| >60               | 16                     | 4 (25.0%)                |
| <b>Total</b>      | <b>144</b>             | <b>41 (28.5%)</b>        |

Table 2 shows the gender-wise distribution of stool samples and parasite positivity. Out of 144 samples, 82 were from males and 62 from females. Parasitic infection was detected in 25 males (30.5%) and 16

females (25.8%), giving an overall positivity rate of 41 cases (28.5%). Positivity was slightly higher among males compared to females.

| Gender       | Total samples | Positive (%)      |
|--------------|---------------|-------------------|
| Male         | 82            | 25 (30.5%)        |
| Female       | 62            | 16 (25.8%)        |
| <b>Total</b> | <b>144</b>    | <b>41 (28.5%)</b> |

Table 3 depicts the distribution of parasites detected in stool samples. *Entamoeba histolytica* was the most frequently identified parasite, found in 18 cases (12.5%), followed by *Giardia lamblia* in 9 cases (6.3%). Among helminths, *Ascaris lumbricoides* was detected in 5 cases (3.5%), hookworm in

4 cases (2.8%), and *Hymenolepis nana* in 2 cases (1.4%). *Taenia* species and *Enterobius vermicularis* were each identified in 1 case (0.7%). Mixed infection was also observed in 1 case (0.7%). Overall, 41 samples (28.5%) were positive for parasitic infection.

| Parasite identified            | Number detected (%) |
|--------------------------------|---------------------|
| <i>Entamoeba histolytica</i>   | 18 (12.5%)          |
| <i>Giardia lamblia</i>         | 9 (6.3%)            |
| <i>Ascaris lumbricoides</i>    | 5 (3.5%)            |
| Hookworm                       | 4 (2.8%)            |
| <i>Hymenolepis nana</i>        | 2 (1.4%)            |
| <i>Taenia</i> species          | 1 (0.7%)            |
| <i>Enterobius vermicularis</i> | 1 (0.7%)            |
| Mixed infection                | 1 (0.7%)            |
| <b>Total positive cases</b>    | <b>41 (28.5%)</b>   |

Table 4 shows the distribution of protozoal and helminthic infections among 41 positive cases. Protozoal infections were the most common, accounting for 27 cases (65.9%), followed by helminthic

infections with 13 cases (31.7%), while mixed infection was rare, observed in only 1 case (2.4%). This indicates that protozoal parasites predominate over helminths in the study population.

| Type of parasite | Number (%)       |
|------------------|------------------|
| Protozoa         | 27 (65.9%)       |
| Helminths        | 13 (31.7%)       |
| Mixed infection  | 1 (2.4%)         |
| <b>Total</b>     | <b>41 (100%)</b> |

Table 5 depicts the relationship between stool consistency and parasite detection among 144 samples. Overall, 41 samples (28.5%) were positive for parasites. Positivity was lowest in formed stools with 8/48 (16.7%), increased in semi-formed stools 11/37 (29.7%), and was highest in loose stools 15/39

(38.5%), while watery stools also showed high detection 7/20 (35.0%). This indicates that parasitic detection increased as stool consistency became looser, suggesting diarrheal stools had a higher likelihood of parasite presence.

**Table 5: Consistency of stool and parasite detection**

| Stool consistency | Total samples | Positive (%)      |
|-------------------|---------------|-------------------|
| Formed            | 48            | 8 (16.7%)         |
| Semi-formed       | 37            | 11 (29.7%)        |
| Loose             | 39            | 15 (38.5%)        |
| Watery            | 20            | 7 (35.0%)         |
| <b>Total</b>      | <b>144</b>    | <b>41 (28.5%)</b> |

## Discussion

The current retrospective study indicated an overall intestinal parasitic infection (IPI) prevalence of 28.5, which is within the broad range of prevalence reported in developing countries but higher than a number of studies based in hospitals that reported lower prevalence rates of 6.9 and 8.9 (Praharaj et al., 2017; Kang et al., 1998) [6,7]. The inconsistency in prevalence among different studies is not surprising since the prevalence is highly influenced by the method of diagnosis, the number of samples of stools analysed, and the level of sanitation in the locality. In other parts of India, heterogeneity has been observed to be significant (below 10 percent in tertiary-care environments and above 30 percent in community-based studies) (Singh et al., 2013; Teja et al., 2020) [8,9]. The implication of our finding is thus a moderate level of endemicity in our study population, which may be due to continuous transmission by means of contaminated water and food and also non-sporadic cases.”

Our study age-wise distribution indicated that there was an infection among all age groups with a slight preponderance in middle-aged and adult persons (33.3% in 5160 years), but the prevalence of children was 30.7%. Equivalent adult preeminence has been reported on studies of hospitals in the north of India in which adults exhibited greater infection rates than kids (Singh et al., 2013; Saurabh et al., 2017) [8,10]. This trend is unlike most community surveys that tend to have school-going children as generally the most impacted group due to their unhealthy hygiene habits (Mehraj et al., 2008) [11]. The comparatively similar age distribution in our population might also have to do with the relatively better national deworming measures among the children, which have decreased the burden of the disease in childhood, but adult reservoirs of infection have been left relatively stable (Ajjampur et al., 2021) [12]. We are therefore in agreement with the idea that carriers of the disease in partially controlled endemic contexts are adult, keeping the cycles of transmission.

Gender distribution in the current study showed that there was a moderately high rate of infections in males (30.5%), as compared to the females (25.8%). Male preponderance has also been observed in community and refugee populations and has been commonly associated with occupational exposure,

activities outside and hormonal modulation of immune (Lifson et al., 2002; Klein, 2004) [13,14]. Nevertheless, that difference in our findings was not significant, and thus, it is more likely that environmental exposure and not the mere behavioral factors cause transmission in the region. Similar low gender variations have also been characterized in a number of Indian tertiary-care reports (Saurabh et al., 2017) [10], indicating that both sexes are equally susceptible in case of poor sanitation.

In our study the protozoal infections were more in number (65.9) as compared to the helminths (31.7). This observation is similar in several Indian-based hospital studies that protozoa have gradually replaced the helminths as the primary etiological agent as a result of better deworming efforts but still because of the continued pollution of drinking water (Marothi & Singh, 2011) [15]. Protozoa took over in excess of 90% of infections in the western Rajasthan (Saurabh et al., 2017) [10], which is greater than our percentage but goes hand in hand with the epidemiological change. On the other hand, the population of helminth is also predominant in community surveys in a low sanitation environment (Husen et al., 2022) [16], which means that our study population can be a threshold transition stage.

The most prevalent organism was *Entamoeba histolytica* (12.5%), and then *Giardia lamblia* (6.3%). This trend is consistent with the past Indian reports on amoebiasis which is the most prevalent cause of parasitic diarrhea because of the consumption of contaminated water (Marothi & Singh, 2011) [15]. *Entamoeba histolytica* infects hundreds of millions of people all over the world, and it continues to be a significant public health issue in the tropics (Cui et al., 2019) [17]. The identification of the second most prevalent parasite, *Giardia*, is also consistent with pediatric and adult hospital inquiries, and it is stressed that the pathogen is transmitted fecal-orally with the use of untreated water supplies (Jayaram et al., 2021) [18]. The fact that protozoa are the most common in our findings also supports the necessity of water sanitation, and not a one-way intervention of anti-helminthic therapy.

Our study had relatively low rates of helminthic infections with the *Ascaris lumbricoides* (3.5) and hookworm (2.8) as the most predominant worms. The same decreasing trend in helminth prevalence has been reported after national deworming

(Ajjampur et al., 2021) [12]. Nevertheless, some community-based surveys continue to have prevalence of *Ascaris* of over 8 percent (Husen et al., 2022) [16], meaning that helminthiasis exists in low-hygiene regions. The number of hookworm infections is smaller in our work but clinically relevant due to the fact that light infections may lead to anemia (Ajjampur et al., 2021) [12]. Thus, although the frequency of helminths is lower, the clinical effect of helminths cannot be underestimated.

Our analysis had few cases of mixed infections (0.7%), compared to other Indian studies (813 percent) and 10 percent in urban slums (Mehraj et al., 2008; Saurabh et al., 2017) [11,8]. Very high Mult parasitism has been reported in some endemic countries of up to over 80% (Sayasone et al., 2011) [19]. The fact that the rate of co-infection among our population is low may be indicative of better hygiene habits or urban healthcare, or it may be indicative of single-sample examination as opposed to repeated sampling.

A key finding was the correlation between stool consistency and detection rate whereby loose stools were most positive (38.5%). This is consistent with the clinical evidence, in which diarrheal stools are more likely to provide positive results due to the active shedding of trophozoites and cysts during symptomatic infection (Jayaram et al., 2021) [18]. The formed stools with reduced detection (16.7%) is presumably an asymptomatic carrier who sheds every now and then. Therefore, the stool consistency must be taken into account when diagnostic yield is being interpreted.

Generally, the current results provide a moderate prevalence characterized by protozoal infections, presence of adults, and low male predominance. In comparison to the previous Indian reports, where the epidemiologic pattern was that of helminth, the epidemiology seems to be changing to protozoal infection through water. Safe drinking water, sanitation and regular stool screening programs should therefore be put in the limelight of the public health strategies instead of depending on the deworming programs.

### Conclusion

The current retrospective study illustrates that intestinal parasite infections are a significant health issue in all age groups and the incidences have been observed all over the population and not just among a certain number of people. The presence of males was detected slightly more frequently than females and the presence of infections was identified in both formed and diarrheal stool samples, although it was more commonly detected in altered stool consistency. Protozoal parasites outnumbered the helminthic infections with *Entamoeba histolytica* and *Giardia lamblia* being the most widely occurring organisms although helminths and mixed infections

were also detected. The findings highlight persistent fecal-oral transmission and indicate the continued need for improved sanitation, safe drinking water, hygiene education, and routine stool examination for early diagnosis and prevention of intestinal parasitic infections.

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