

ORIGINAL RESEARCH

Parasitological evaluation of diarrhoeic stools from patients attending a tertiary care centre in western Uttar Pradesh

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ABSTRACT

Background: Intestinal parasitic infections are a major public health problem in developing countries like India. The prevalence and distribution of parasites vary from region to region within a country. Stool routine examination is a great tool in identifying various parasitic and nonparasitic causes in patients presenting with diarrhea to a health facility. Knowledge of the prevalence and distribution of different parasites causing infection in a particular region helps to devise appropriate prevention and control measures.

Aim and Objectives: The aim of this study was to analyze diarrheic stools submitted to the parasitology lab by stool routine examination & to identify the prevalence and distribution of intestinal parasites causing infection in this particular region.

Material & Methods: A total of 545 stool samples received in the parasitology lab for stool routine examination were evaluated for gross and microscopic findings with an emphasis on the detection of intestinal parasites. Stool samples were evaluated with normal saline and iodine mounts.

Results: A total of 545 stool samples were examined out of which 40 were found to have intestinal parasitic infection with a prevalence rate of 7.6%. Parasitosis was seen more in males (8.2%) as compared to females (6.4%). Parasitosis was found to be mostly prevalent in the age group 11- 20 years followed by 31-40 years (9.5%). Cyst of *Giardia lamblia* (35%) was the most commonly detected protozoa followed by cyst & trophozoite of *Entamoeba histolytica* (22.5%).

Conclusion: Intestinal protozoal infections are more prevalent than helminthic infections. Improvement in drinking water quality and personal and food hygiene will help in reducing parasitic infections.

Keywords: Intestinal parasites, stool routine examination, *Giardia lamblia*.

INTRODUCTION

Intestinal parasitic infections reflect upon the general hygiene level, sanitary practices, and availability of safe drinking water supply in a community. Intestinal parasitic infection is a

major health problem in developing countries including India. Low socioeconomic conditions, lack of access to potable drinking water, poor personal hygiene, and environmental sanitation are the factors associated with intestinal parasitic infection. These infections cause morbidity and mortality along with other manifestations like iron deficiency anemia, growth retardation in children, and other physical and health problems.¹ Helminthic infection is also related to protein-energy malnutrition, low pregnancy weight, and intrauterine weight gain. Most of these are transmitted through soil, their route of transmission being faecally contaminated fingers or sometimes migrating through the skin to the intestine.² The prevalence of parasitic infections varies from country to country and region to region within a country depending upon the social, environmental, and economical factors. Therefore this study was contemplated to assess the prevalence of parasitic infections in the northwestern region of India in the state of Uttar Pradesh.

MATERIAL & METHODS

This study was undertaken in the Department of Microbiology, K D Medical College & Hospital, Mathura from July 2018 to July 2019 of all age groups and includes stool samples of the patients admitted to the wards as well as those attending the outpatient department of the tertiary care hospital with a total sample size of 545. Stool samples were received from the patients presenting with complaints of diarrhea and other gastrointestinal symptoms such as nausea, vomiting, flatulence, and pain abdomen. More than one sample collected from a single patient having the same findings was excluded from the study. Stool samples were collected in universal containers without preservatives. The demographic data of each case, i.e., age and sex along with stool examination findings were noted. The samples received were subjected to complete examination both gross and microscopy within 1-2 h of their collection. In gross examination consistency of the stool sample, presence of mucus, blood, intestinal worm, and segments of the tapeworm were noted. The microscopic examination included saline and iodine wet mount, which was observed under 10× and 40× magnifications. The wet mount was screened for the presence of ova and cysts of the parasite. Protozoa and helminths were identified according to morphological details.³ Fecal occult blood examinations were done in some cases on the request of clinicians to identify the presence of small amounts of blood loss not visible grossly.

STATISTICAL ANALYSIS

The interpretation and analysis of the data obtained were done using Microsoft Excel. The quantitative data were expressed as percentages in tabular form.

RESULTS

A total of 545 stool samples were examined out of which 40 were found to have an intestinal parasitic infection with a prevalence rate of 7.6%. Various parasites identified among the study population were protozoans and helminths. Out of 545 samples, 326 (59.8%) were obtained from males & 219 (40.2%) were obtained from females. Parasitosis was also seen more in males (8.2%) as compared to females (6.4%). Parasitosis was found to be most prevalent in the age group 11- 20 years followed by 31-40 years (9.5%), 21-30 years (9.2%), 0-10 years (6.1%), 41-50 years (4.2%), 51-60 years (3.8%), > 60 (3.1%) as shown in Table 1. On gross examination of the stool samples, 406 (74.5%) samples were of semi-solid consistency, 77 (14.1%) stool samples were of liquid consistency & 62 (11.4%) samples were solid. Out of 545 samples, mucus was present in 146 (26.8%) samples while mucus was absent in 399 (73.2%) samples. Frank blood was present in 2 (0.37%) samples while it was absent in 543 (99.6%) samples out of 545 samples. (Table 2)

Various protozoan & helminthic parasites were identified from the stool samples submitted in the parasitology lab for analysis. Cyst of *Giardia lamblia* (35%) was the most commonly detected protozoa followed by cyst & trophozoite of *Entamoeba histolytica* (22.5%), trophozoite of *trichomonas vaginalis* (22.5%). Among helminths, egg of *Ascaris lumbricoides* (7.5%) was most commonly detected followed by egg of *Ankylostoma duodenale* (5%), egg of *Enterobius vermicularis* (2.5%) & egg of *Hymenolepis nana* (2.5%) (Table 3). Apart from parasites, excess of fat globules was observed in 21(3.9%) out of 545 samples. In addition to stool routine examination, 22 samples were also submitted for hanging drop preparation examination. Out of 22 samples observed darting motility was observed in 1(4.5%) sample suggestive of *Vibrio cholerae* infection. Apart from stool routine examination, occult blood was also requested by clinicians in 228 stool samples. Out of 228 samples tested 64(28%) were positive for occult blood while 164 (72%) were negative (Table 4). All parasitic infections were from a single organism except one stool sample where both cysts of *Entamoeba histolytica* and egg of *Enterobius vermicularis* were observed.

Table 1: Age & sex wise distribution of intestinal parasites in stool samples (N=545)

Age in years	Male		Female		Total organism number(%)
	Total Sample Number	Organisms number (%)	Total Sample Number	Organisms number (%)	
0-10	40	3(7.5%)	42	2(4.8%)	5(6.1%)
11-20	57	7(12.2%)	29	5(17.2%)	12(13.9%)
21-30	70	9(12.9%)	28	0(0%)	9(9.2%)
31-40	34	4(11.8%)	29	2(6.9%)	6(9.5%)
41-50	39	2(5.1%)	33	1(3.0%)	3(4.2%)
51-60	47	1(2.15%)	32	2(6.3%)	3(3.8%)
> 60	39	0(0%)	26	2(8%)	2(3.1%)
Total	326(59.8%)	26 (8.2%)	219(40.2%)	14(6.4%)	40(7.6%)

Table 2: Gross examination features of stool samples (N=545)

FEATURES	NUMBER OF SAMPLES		
1. CONSISTENCY	SOLID	SEMI-SOLID	LIQUID
	62(11.4%)	406(74.5%)	77(14.1%)
2. PRESENCE OF MUCUS	MUCUS PRESENT	MUCUS ABSENT	
	146(26.8%)	399(73.2%)	
3. PRESENCE OF BLOOD	BLOOD PRESENT	BLOOD ABSENT	
	2(0.37%)	543(99.6%)	

Table 3: Distribution of intestinal parasites in stool samples (N= 40)

Name of parasite	Number
<i>Ankylostomadudenale</i> (egg)	2 (5%)
<i>Ascaris lumbricoides</i> (egg)	3(7.5%)
<i>Giardia lamblia</i> (cyst)	14(35%)
<i>Giardia lamblia</i> (cyst & trophozoite)	1(2.5%)
<i>Entamoeba histolytica</i> (cyst)	4(10%)
<i>Entamoeba histolytica</i> (cyst & trophozoite)	5(12.5%)
<i>Enterobius vermicularis</i> (egg)	1(2.5%)
<i>Hymenolepis nana</i> (egg)	1(2.5%)
<i>Trichomonas vaginalis</i> (trophozoite)	9(22.5%)

Table 4: Occult blood examination (N=228)

Occult blood	Positive	Negative
	64(28%)	164(72%)

DISCUSSION

Feces are the solid or semi-solid remains of food that were not digested in the small intestine and have been broken down by bacteria in the large intestine. It is regarded as a waste byproduct of the digestion of food but is an important laboratory sample that gives us an insight into digestive tract abnormalities on gross and microscopic examination. Some stool tests can be easily used in primary care in the differential diagnosis of disorders such as gastrointestinal infections, malabsorption syndromes, and inflammatory bowel diseases. Stool tests can prevent unnecessary laboratory investigations. Stool analysis includes gross examination like consistency, color, quantity, presence of mucus, blood, parasitic segments, microscopic examination, occult blood, pH, chemical, immunological, and enzymatic tests. The importance of direct stool examination in evaluating patients with diarrhea was recognized by several authors in the past confirming its value in shigellosis and parasitic infections.⁴

Gross examination findings of stool also help in identifying abnormalities which help in indicating pathology in the gastrointestinal tract. The stool has a soft but firm consistency under normal conditions. A change in consistency to semi-solid or liquid may have underlying bacterial, parasitological, viral or malabsorptive pathology due to metabolic disorders. Out of 545 stool samples, 406 (74.5%) samples were semi-solid, 77(14.1%) were liquid & 62(11.4%) were solid in consistency. All stool samples in which parasites were identified were semi- solid.

A small amount of mucus in stool is usually nothing to worry about. Stool normally contains a small amount of mucus in the intestines to keep the lining of the colon moist and lubricated. Larger amounts of mucus in stool, associated with diarrhea, may be caused by certain intestinal infections. Bloody mucus in stool, or mucus accompanied by abdominal pain, can represent more serious conditions like Crohn's disease, ulcerative colitis, and even cancer.

Out of 545 stool samples, mucus was present in 146 (26.8%) samples while mucus was absent in 399(73.8%). Eight stool samples out of 40 positives for intestinal parasites did not have mucus. Pathology other than parasitic infections like Crohn's disease, irritable bowel disease, lactose intolerance, celiac disease & other intestinal infection would be definitely associated in such stool samples where mucus was present and no parasites were detected.

Presence of frank fresh blood was found on gross examination of two stool samples which were also associated with the presence of plenty of pus cells. On further investigation by culture of the stool samples, the infection was found to be due to *Shigella* spp. The signs of bleeding in the digestive tract depend upon the site and severity of bleeding. If blood is coming from the rectum or the lower colon, bright red blood will coat or mix with the stool. The digestive or gastrointestinal (GI) tract includes the esophagus, stomach, small intestine, large intestine or colon, rectum and anus. Bleeding can come from one or more of these areas - from a small area like an ulcer on the lining of the stomach or from a large surface, such as an inflammation of the colon. Bleeding can sometimes occur without the person noticing it. This type of bleeding is called occult or hidden.

Occult blood examination was requested in 228 samples out of 545 stool samples submitted to the parasitology lab. Out of the 40 stool samples positive for intestinal parasites occult blood was positive in two samples in which both cyst & trophozoite of *Entamoeba histolytica* were isolated & two stool samples in which trophozoite of *Trichomonas vaginalis* was isolated. *Trichomonas vaginalis* is thought to be non-pathogenic although it has been

associated with diarrheic stools. Occult blood positivity could be an incidental finding where some other pathology could be the reason for positive occult blood test.

Intestinal parasitic infections are an important cause of diarrheic stools & a major public health issue in the tropics, especially in developing countries like India. An increase in the migratory population from one region to another in search of work and settlement and increased construction works lead to an increase in unhygienic & unsanitary conditions leading to an increase in parasitic infections among the people. Knowledge of the extent and distribution of the common parasites causing infection in a particular region helps to give insight in planning and evaluating interventional programs. The present study results showed the occurrence of several intestinal parasites of public health importance in people residing in this area. In the present study, the prevalence of parasitic infection was found to be 7.6% which is in accordance with the study conducted by Rajvir Singh et al.⁵ in 2013 wherein the prevalence was found to be 6.68% and Devane., et al.⁶ in 2012. but low when compared with Marothi et al.⁷, (21.4%), and Parameshwarappa et al.⁸, (27.6%). Chandrashekhar and Nagesha⁹ (68%) have reported a quite high prevalence rate in their study.

In the present study, it was observed that the prevalence of intestinal parasitic infection was seen more among males (26/40) than in females (14/40). Peerzada BY¹⁰ et al. have also reported more parasites in male patients (90/165) than in female patients (75/165). Kumar Saurabh et al.¹¹ also reported more parasitic infections in males (98/158) as compared to females (60/158). Kotian et al.¹² in contrast reported more infections in females (21/38) than the males (17/38). Among the isolated protozoan parasites, Cyst of *Giardia lamblia* (35%) was the most commonly detected protozoa followed by cyst & trophozoite of *Entamoeba histolytica* (22.5%) & egg of *Ascaris lumbricoides* (7.5%) was most commonly detected followed by egg of *Ankylostoma duodenale* (5%) among helminths. Kotian et al.¹² also found *Giardia* as the most commonly isolated parasite (3.06%). *Giardia* was reported as the most commonly isolated parasite by other authors also like Dongre et al.¹³ & Kaur et al.¹⁴

Peerzada BY et al.¹⁰ in their study found *Ascaris lumbricoides* (71.5%) as the most common followed by *Giardia lamblia* (16.3%), *Taenia* species (6.6%). Wani SA et al. also found the prevalence of *Ascaris lumbricoides* the highest followed by *Giardia lamblia*.¹⁵ Rituparna et al.¹⁶ in their study detected, *E. histolytica* as the most common (40.49%) followed by *Giardia lamblia* (24.44%), *A. lumbricoides* (21.09%), *Enterobius vermicularis* (4.9%). The age-specific prevalence profile of our study population suggests that persons in the age group of 11-20 years (13.9%) were mostly infected with intestinal parasites followed by 31-40 years (9.5%) which is in accordance with the study of Peerzada BY¹⁰ et al. who found the prevalence of most infections in the age group 16-30 years. Kotian et al.¹² have also found most parasitic infections in the age group 11-20 years. The prevalence of *Giardia lamblia* & *Entamoeba histolytica* as the most common parasite is associated with the young adult age group as observed in various studies including ours. This can be attributed to more consumption of outside food, and outdoor activity leading to exposure to contaminated surroundings of the young adult population. The water supply is really an important risk factor for Giardiasis, and several large outbreaks of Giardiasis have resulted from the contamination of the drinking water supply with human waste. *Giardia* cysts have been isolated from water supplies in different parts of the world.^{17,18}

CONCLUSION

To conclude, stool examination is a great tool for the analysis of diarrheic stools for identifying the underlying gastrointestinal pathology. Parasitic infections, though not life-threatening can impair the physical & mental growth of children, may cause malnutrition, and affect the general well-being of adults. In our study, the overall prevalence of parasites was found to be 7.6%. This could be more as the parasites are excreted intermittently and repeat

samples were not taken in this study. The use of concentration methods as a routine could also lead to increased isolation of parasites from stool samples having less parasite load.

REFERENCES

1. World Health Organization. Control of Tropical Diseases. Geneva, Switzerland: WHO; 1998
2. Blaser MJ, Ravindin JI, Guerrant RL, et al. Gastrointestinal tract infections. In: Richard VG, Hazel MD, Derek W, Mark Z, Peter LC, Ivan MR, et al., editors. MIMS Medical Microbiology. 4th ed. Europe: Mosby Elsevier; 2008. p. 304-11.
3. Cheesbrough M. Medical laboratory manual for tropical countries. Vol. 1. Microbiology. 985.
4. Stoll BJ, Glass RI, Banu H, Huq MI, Khan MU, Ahmed M. Value of stool examination in patients with diarrhoea. *Br Med J (Clin Res Ed)*. 1983 Jun 25;286(6383):2037-40. doi: 10.1136/bmj.286.6383.2037. PMID: 6307460; PMCID: PMC1548513.
5. Singh R, Singla P, Sharma M, Aparna, Chaudhary U. Prevalence of Intestinal Parasitic Infections in a Tertiary Care Hospital in Northern India: Five year retrospective study. *Int J Curr Microbiol App Sci*. 2013;2(10):112–7.
6. Davane MS, Suryawanshi NM, Deshpande KD. A prevalence study of intestinal parasitic infections in a rural hospital. *Int J Recent Trend Sci Technol*. 2012;2(1):1–3.
7. Marothi Y, Singh B. Prevalence of intestinal parasites at Ujjain, Madhya Pradesh, India: Five-year study. *Afr J Microbiol Res* 2011;5:2711-4.
8. Parameshwarappa KD, Chandrakanth C, Sunil B. The prevalence of intestinal parasitic infestations and the evaluation of different concentration techniques of stool examination. *J Clin Diagn Res* 2012;6:1188-91.
9. Chandrasedhar MR, Nagesha CN. Intestinal helminthic infestation in children. *Ind. J. Pathol. Microbiol* 2003;46:492-94.
10. Peerzada BY, Mir RF, Samad L, Shah A. Prevalence of intestinal parasitic infections in a tertiary care hospital in Kashmir India-five year retrospective study. *IP Int J Med Microbiol Trop Dis* 2022;8(1):69-72.
11. Saurabh K, Nag VL, Dash S, Maurya AK, Hada V, Agrawal R et al. Spectrum of Parasitic Infections in Patients with Diarrhoea Attending a Tertiary Care Hospital in Western Rajasthan, India. *J Clin Diagn Res*. 2017 Aug;11(8):DC01-DC04. doi: 10.7860/JCDR/2017/29001.10346. Epub 2017 Aug 1. PMID: 28969118; PMCID: PMC5620758.
12. Kotian S, Sharma M, Juyal D, Sharma N. Intestinal parasitic infection-intensity, prevalence and associated risk factors, a study in the general population from the Uttarakhand hills. *Int J Med Public Health* 2014;4:422-5.
13. Dongre AR, Deshmukh PR, Boratne AV, Thaware P, Garg BS. An approach to hygiene education among rural Indian school going children. *Online J Health Allied Sci* 2007;6:1-6
14. Kaur R, Rawat D, Kakkar M, Uppal B, Sharma VK. Intestinal parasites in children with diarrhea in Delhi, India. *Southeast Asian J Trop Med Public Health* 2002;33:725-9.
15. Wani SA, Ahmad F, Zargar SA, Ahmad Z, Ahmad P, Tak H, et al. Prevalence of intestinal parasites and associated risk factors among schoolchildren in Srinagar City. *J Parasitol*. 2007;93(6):1541–3.
16. Rituparna B, Bhattacharya P, Paul UK, Bandyopadhyay A. Prevalence of Intestinal Parasites in a Tertiary Care Hospital in Rural Bihar. *Int J Sci Stud* 2017;4(12):89-93.
17. Wilson ME. In: Wallace RB, editor. *Giardiasis in Public Health and Preventive Medicine*. 14th ed., Vol. 10. New York: Appleton and Lange; 1998. p. 252-4. 18.

18. Zuckerman U, Armon R, Tzipori S, Gold D. Evaluation of a portable differential continuous flow centrifuge for concentration of *Cryptosporidium* oocysts and *Giardia* cysts from water. *J Appl Microbiol* 1999;86:955-61.