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Original Article

Microbiology Section

Spectrum of Parasitic Infections in Patients with Diarrhoea Attending a Tertiary Care Hospital in Western Rajasthan, India

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ABSTRACT

Introduction: Owing to the poor socioeconomic conditions and lack of sanitary hygiene, a large number of population in developing countries remain under constant threat of different parasitic infections causing severe morbidity and mortality. Enough measures to prevent and reduce the disease burden are still to be undertaken.

Aim: Aim of the study was to determine the spectrum of parasitic infections in patients with complaints of diarrhoea and other gastrointestinal symptoms attending a tertiary care hospital in Western Rajasthan, India.

Materials and Methods: It is a retrospective study conducted in the Department of Microbiology, All India Institute of Medical Sciences, Jodhpur, India, between the period of September 2014 and April 2016. The records of routine stool examination carried out during the study period, were analyzed. A total of 968 stool samples from the same number of patients complaining of diarrhoea and other gastrointestinal symptoms such as nausea, vomiting, flatulence, and pain abdomen were received from different outdoor and indoor wards of the hospital. Microscopic examination was performed after the concentration of stool samples by formol-ether concentration technique and their wet mount preparations. Modified Ziehl-Neelsen (ZN) staining was performed on 17 samples for the detection of coccidian parasites.

Results: Out of 968 cases, 158 (16.3%) were found to be infected with either a parasite or a commensal or both. A maximum number of isolates (21.1%) were from the age group of 31-40 years. Overall, protozoans (95.38%) were detected in excess of helminths (4.62%). The most common protozoa isolated was *Entamoeba histolytica* (37.57%) followed by *Giardia lamblia* (23.12%), and the most common helminth isolated was *Hymenolepis nana* (2.9%) followed by *Ascaris lumbricoides* (1.15%). Out of 17 stool samples, where modified ZN staining was performed, *Cryptosporidium* spp., *Isospora belli,* and *Cyclospora* spp. were detected in one sample each.

Conclusion: Intestinal protozoal infections are more prevalent as compared to helminthic infections in this study group.

Keywords: Helminth, Intestinal parasitic infections, Protozoa

INTRODUCTION

Intestinal parasitic infections are one of the major health menaces which has affected around 3.5 billion people and caused illness in around 450 million, majority being children [1]. It has been reported that annually, two lakh deaths are caused due to these infections, mainly in developing countries [2,3]. More than 1.5 billion people are infected with particularly soil-transmitted helminthic infections including 270 million preschool-age children and over 600 million school-age children [4]. Amoebiasis, giardiasis, ascariasis, hookworm infection, and trichuriasis are the most common infections leading to iron-deficiency anaemia, chronic diarrhoea, seizures, portal hypertension, and impaired physical development in children along with other comorbidities [5,6].

Even, the intestinal commensals serve as indicators of the socioeconomic and sanitation conditions of a population, as they share the same mechanisms of transmission as that of protozoan parasites [7]. *Blastocystis hominis*, a cosmopolitan protozoa, which had been considered a commensal of the large intestine for a long time, is now being regarded as a parasitic organism [8].

The magnitude of intestinal parasitic infections in patients with diarrhoea needs to be carefully monitored in the developing countries. Several studies have been undertaken in different parts of India [9-23] and few parts of Rajasthan [24-28]. These infections still continue to predominate and similar studies would definitely add to the existing knowledge of parasitic infections in patients suffering from gastrointestinal problems.

This study was aimed to determine the spectrum of parasitic infections in patients with complaints of diarrhoea and other gastrointestinal symptoms such as nausea, vomiting, flatulence, and pain abdomen attending a tertiary care hospital in Western Rajasthan, India. Parasitic coinfections were also studied.

MATERIALS AND METHODS

It is a retrospective study conducted in the Department of Microbiology, All India Institute of Medical Sciences, Jodhpur, between the period of September 2014 and April 2016. The records of routine stool examination carried out during the study period, were analyzed. Stool samples received from the patients of different outdoor and indoor wards, presenting with complaints of diarrhoea and other gastrointestinal symptoms such as nausea, vomiting, flatulence, and pain abdomen were included in the study. More than one sample collected from a single patient having same findings were excluded from the study. A total of 968 cases of all age groups including 604 males and 364 females formed the study population. The demographic data of each case, i.e., age and sex along with stool examination findings were noted. All stool samples were tested as per the routine laboratory protocol, which included gross and microscopic examination within one hour of its collection. In gross examination, the colour and consistency of the stool samples, presence or absence of mucus, blood, adult worms, and body segments of the parasites were noted. Stool samples were further examined microscopically in wet mount preparation of normal saline and Lugol's iodine after concentration, using formol-ether stool concentration technique [29]. The presence of ova, larvae, cysts, and trophozoites of various parasites as well as other intestinal commensals were noted. In 17 cases, additional

Age in years	Male		Female		Total organisms number (%)
	Total sample number	Organisms number (%)	Total sample number	Organisms number (%)	
0-10	181	33 (18.2)	113	23 (20.3)	56 (19.0)
11-20	145	24 (16.5)	78	13 (16.6)	37 (16.6)
21-30	97	20 (20.6)	48	06 (12.5)	26 (17.9)
31-40	69	14 (20.3)	49	11 (22.4)	25 (21.1)
41-50	41	03 (07.3)	33	06 (18.2)	09 (12.2)
51-60	29	05 (17.2)	18	01 (5.5)	06 (12.7)
>60	42	10 (23.8)	25	04 (16.0)	14 (20.9)
Total	604	109 (18.04)	364	64 (17.6)	173 (17.8)

[Table/Fig-1]: Age and sex wise distribution of intestinal parasites and commensals detected in stool samples.

detection of coccidian parasites were done during the study period, on request from clinicians. Modified ZN staining was done in all these cases [30].

The approval for this study was obtained from the Institute Ethics Committee. The individual consent was not obtained from each case as this was a retrospective study, and tests were carried out in the microbiology laboratory as a routine procedure.

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

Out of 968 cases, 158 (16.3%) were found to be infected with either a parasite or a commensal or both; 604 samples were from males of which 98 (16.2%) were positive; and among 364 samples from females, 60 (16.5%) were found to be positive. A maximum number of isolates (21.1%) were found in the age group of 31-40 years. Among females, maximum (22.4%) infection was in the age group of 31-40 years, whereas in males (23.8%), it was in the age group of >60 years [Table/Fig-1]. The isolation of protozoans (95.38%) was more as compared to the helminths (4.62%). *Entamoeba histolytica* (37.57%) was the most commonly detected protozoa, followed by *Giardia lamblia* (23.12%), *Entamoeba coli* (22.54%), *B. hominis* (6.94%), and *Iodamoeba butschlii* (5.2%). Among helminths, *Hymenolepis nana* (2.9%) was most commonly detected, followed by *Ascaris lumbricoides* (1.15%) and hookworm (0.57%) [Table/Fig-2].

Single organism was detected in 144 (91.1%) stool samples each, whereas dual organisms were detected each in 13 (8.2%) samples. In a single case, three organisms were detected [Table/Fig-3].

Coccidian parasites were found in three out of 17 stool samples using modified ZN staining [Table/Fig-4]. The patient who was infected with *Isospora belli* was suffering from HIV. In other two cases, HIV status was negative. The patient infected with *Cryptosporidium* sp. was taking antitubercular treatment for pulmonary tuberculosis.

Intestinal parasites and commensals	
Protozoans (165, 95.38)	
Entamoeba histolytica	65 (37.57)
Giardia lamblia	40 (23.12)
Entamoeba coli	39 (22.54)
Blastocystis hominis	12 (6.94)
Iodamoeba butschlii	09 (5.20)
Helminths (08, 4.62)	
Hymenolepis nana	05 (2.90)
Ascaris lumbricoides	02 (1.15)
Hookworm	01 (0.57)

[Table/Fig-2]: Distribution of intestinal parasites and commensals in stool sample.

Type of infection	Number of samples
Dual infection	
Giardia lamblia+Hymenolepis nana	02
Entamoeba histolytica+Hook worm	01
Entamoeba histolytica+Entamoeba coli	03
Entamoeba histolytica+Iodamoeba butschlii	01
Blastocystis hominis+Entamoeba coli	01
Entamoeba coli+Iodamoeba butschlii	05
Triple infection	
Ascaris lumbricoides+Hymenolepis nana+Entamoeba coli	01
Total	14

[Table/Fig-3]: Distribution of organisms causing multiple infections in stool samples.

Parasites	No.
Cryptosporidium spp.	01
Isospora belli	01
Cyclospora spp.	01

[Table/Fig-4]: Parasites detected after modified ZN staining of stool samples (n=17).

ZN: Ziehl-Neelsen.

DISCUSSION

With the regularly changing lifestyles and dietary habits, the incidence of intestinal parasitic infections has upsurged. Many goals are being set from time to time for their control, but due to lack of epidemiological data, it is difficult to accomplish them. As far as Rajasthan is concerned, very few data from different places [24-28] are reported in literature. These studies have not included the intestinal commensals which, besides serving as indicators of the socioeconomic and sanitation conditions of a population, are on the rise causing various opportunistic infections [7,8].

In this study, the intestinal parasites were detected in 16.3% of the cases which is in accordance with earlier studies done in different parts of the state and ranges from 5.2% to 43.6% case [24,25,28]. The study conducted in Udaipur among the individuals of Bhil tribe [27] showed a high isolation rate of about 51.78% as compared to this study. Such differences may occur due to the varied socioeconomic conditions of different communities.

The percentage detection is almost similar in males (16.2%) and females (16.5%) and is in accordance with the findings of Kavathia G et al., [11,12]. In some other studies, detection rate was higher in males [10,18,19] and in some females were found to have predominant infection [13]. Such variations may be due to equal involvement of females in outdoor activities as compared to males nowadays. In various studies, the most common age group involved was 6-20 years [14,18,19,27] as compared to this study, where it is 31-40 years. In a previous study also, the trend of parasitic infection in recent years has shown to predominate among adults as compared to children [9].

In some studies, helminthic infections were found to predominate [14,23] while in this study protozoal infection (95.38%) far more exceeded the helminthic infections (4.62%). Protozoal infections were also predominant in some other studies from Rajasthan [25,27] as well as from different parts of country [11,12,21]. In this study, the most common protozoa isolated was *Entamoeba histolytica* (37.57%), followed by *Giardia lamblia* (23.12%) and *Entamoeba coli* (22.54%). *Entamoeba histolytica* followed by *Entamoeba coli* was also found to be the main protozoan in the study conducted among the Bhil tribe in Rajasthan [27] but strikingly, *Giardia lamblia* was not isolated even in a single case

in that study. *Entamoeba histolytica* followed by *Giardia lamblia* has also been found as the main protozoan in studies from other parts of India [11,12,21,22], whereas *Giardia lamblia* followed by *Entamoeba histolytica* has been found in others [9,14,19]. Although we could find very less helminths, *Hymenolepis nana* followed by *Ascaris lumbricoides* was the most common among them, which is in accordance with the study done in Southern Gujarat by Patel MM et al. [14]. In other studies, *Ascaris lumbricoides* was found to be the most common helminth [9,11,12,19,21,22,31]. Such variations in the parasite prevalence may be accounted to the difference in geographic conditions and cultural practices and food habits in different regions, which further strengthens the need for such type of studies.

Mixed infections in 8.9% samples in this study suggest that parasitic infections do not always exist singly, but protozoal and helminthic infections can coexist. Mixed infections were also found in 13.39% cases in a study from Rajasthan [27] and in 13.4% cases in another study [23].

Among the three stool samples [Table/Fig-4] infected with coccidian parasites, the case infected with *Isospora belli* was HIV positive, whereas the case infected with *Cryptosporidium* sp. was suffering from tuberculosis. Intestinal parasitic coinfection with tuberculosis without HIV infection has been studied in the past [32]. Studies also have shown that coccidian parasites infect the immunocompromised patients suffering from HIV [33,34]. The presence of coccidian parasites in two patients not suffering from HIV, stresses on the need for further investigation into their relevance in non-HIV patients.

LIMITATION

As this was a retrospective record based study, several demographic data pertaining to the socioeconomic conditions and other risk factors could not be collected. Single stool samples were taken from each patient and also modified ZN staining was not performed on each sample which could have diagnosed additional cases infected with parasites. This study being a hospital based study, cannot determine the true burden of parasitic infections in the community, for which more studies at community and village levels are needed with larger sample size.

CONCLUSION

Protozoal infections were more prevalent as compared to helminthic infections in the present study group. Intestinal parasitic infection is on the rise among the adult patients and may be caused due to single or multiple parasites, which must be considered while administering treatment to the patients presenting with diarrhoea or other gastrointestinal symptoms. Intestinal commensals too serve as indicators of the socioeconomic and sanitation conditions of a population, so their presence in stool samples must also be taken into account and clinical correlations must be done wherever required. Such types of hospital-based studies are always helpful in accessing the present burden of parasitic infections in patients suffering from gastrointestinal diseases. Our study would surely add to the existing knowledge of parasite prevalence in such type of patients and serve as a measure of their inclination toward the health indicators.

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