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Prevalence of Intestinal Parasites among Patients attending a Tertiary Care Centre in South India

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A B S T R A C T

Intestinal parasitic infections are important public health problem and are globally endemic. It constitutes single worldwide cause of morbidity and mortality. The prevalence is presumed to be high in developing countries like India probably due to poor sanitary conditions and improper personal hygiene. This study was estimate the burden of the intestinal parasitic infections and the current pattern of distribution in patients attending a tertiary care setting in Puducherry, India. This is a retrospective study carried out over a period of 5 years (Aug 2011 to Jun 2016). Stool samples of patients received in the parasitology section, Dept. of Microbiology, JIPMER were subjected to routine stool investigations. The results were recorded, and data was presented in the form of frequency and distribution. A total of 1508 fresh stool samples were screened, of which 22.2% (n=335) were positive for various intestinal parasites. Overall, protozoal infections (16.25%) were higher than helminthic infections (5.97%). On the whole, *Entamoeba* species showed higher prevalence (39.7%) followed by *Blastocystis* (13.4%) and *Ascaris* (11.34%). Among the coccidian parasites identified, *Cystoisospora* showed maximum positivity (2.7%). There was a noticeable female predominance pattern (56%) compared to male showing 43.9% positivity. The results conclude that *Entamoeba* spp., and *Ascaris* are the most common protozoal and helminthic parasites respectively present in the study population. In our study population, age group between 31-40 years are predominantly infected with these parasites. Apart from the early diagnosis and effective treatment, health education is a requisite to control infections in developing countries.

Introduction

Intestinal parasitic infections are believed to be the most common and important public health problem worldwide. These parasites constitute the greatest single universal cause of morbidity and mortality. More than 60% of the global population is infected with enteric parasites (WHO, 2002). The prevalence is said to be high in developing countries, probably due to poor sanitary conditions and improper personal hygiene.

The other factors attributable to the prevalence of these infections are poverty, illiteracy, tropical hot and humid weather conditions and contaminated drinking water resources (Sadeghi and Borji, 2015). Consequently, the epidemiological pattern of these parasites varies in different geographical regions.

Parasitic infections cause substantial hindrance to socio-economic developments, particularly in developing countries. This can be due to the ill effects and retarded physical and mental development of children caused by the parasites. Approximately 39 disability-adjusted life years (DALY) is associated with enteric parasitic infections, thus representing a major global and economic burden (Ramana, 2012).

Enteric protozoan parasites and the soil-transmitted helminths are responsible for gastrointestinal disturbances leading to infections. The WHO report states that amoebiasis caused by the protozoan parasite *Entamoeba histolytica* is the third most common parasitic cause of morbidity and mortality, with an estimate of about 50 million infections worldwide (WHO, 1997) followed by giardiasis caused by *Giardia intestinalis*/ *duodenalis* and cryptosporidiosis caused by *Cryptosporidium* spp. *Ascaris lumbricoides* and *Hymenolepsis nana* are the commonest nematode and cestode affecting approximately 1 billion people (CDC, 2006).

Intestinal parasitic infections are a major source of health concern in India like in any other developing nations. The overall prevalence of intestinal infections, caused by enteric parasites ranges from 12.5 - 67% in our country. Limited studies determining the prevalence of intestinal parasitic infections have been published previously from South India (Gang *et al*., 1998; Fernandez *et al*., 2002; Dhanabal *et al*., 2014). These studies report the prevalence of intestinal parasitic infections among slum-dwellers and children of rural and urban locations of Chennai, Tamilnadu respectively (Dhanabal *et al*., 2014; Fernandez *et al*., 2002). The prevalence of the pathogenic intestinal parasites has been determined among a Southern Indian rural community from Vellore district of Tamilnadu (Gang *et al*., 1998).

Studies related to the overall frequency of enteric parasites in the Union Territory of Puducherry have been scanty (Parija & Rao, 1987); whereas, a study related specifically to helminthic infections in school children from Puducherry have been published in the recent past (Ragunathan *et al*., 2010). To our knowledge, no recent studies, taking into account the overall prevalence of the intestinal parasites from Puducherry has been reported. Therefore, this study was conducted to determine the present distribution pattern of the intestinal parasites among patients attending a tertiary care hospital in Puducherry, South India.

Methodology

Study design

This is a hospital-based retrospective study for a period of five years (2011- 2016) conducted in the Parasitology Section, Department of Microbiology, JIPMER, Puducherry, India. Patients in all age groups, both the genders with or without gastrointestinal disturbance were included in this study. The approval to use the samples for this study was obtained from JIPMER Institute Ethics Committee (IEC). Stool samples of patients received in the section were subjected to routine stool investigation

during the study period. The macroscopic examination was carried out for the presence of helminthic body segments and to record consistency of stool. Further, various microscopic examination methods such as direct wet mount, stool concentration techniques and staining methods (Wheatley's modified Trichrome staining and modified acid-fast staining) were employed for efficient detection of the parasites. The results were recorded, and the data was analysed in the form of frequency and distribution.

Results and Discussion

A total of 1508 samples were screened, of which 22.21% (n=335) were positive for intestinal parasites. In general, protozoal infections (16.25%) showed a higher prevalence pattern compared helminthic infections (5.97%) (Figure: 1A). During the study period of approximately 5 years, enteric protozoan parasites (*Entamoeba histolytica*/ *E. dispar*/ *E. moshkovskii*, *Entamoeba coli*, *Giardia intestinalis*/ *duodenalis*, *Blastocystis* and *Balantidium coli*), coccidian parasites (*Cystoisospora*, *Cyclospora* and *Cryptosporidium* spp.,) and helminths (*Ascaris*, *Trichuris trichura*, *Enterobius* and *Taenia*) were identified in our study population.

Among the parasites identified, *Entamoeba* spp., (39.7%) was found to be the commonest, followed by *Blastocystis* (13.4%) and *Ascaris* (11.34%). Among the coccidian parasites, *Cystoisospora* showed maximum positivity (2.7%) preceded by *Cryptosporidium* spp., (1.5%). Other uncommon parasites encountered were *Taenia* egg (1.19%), *Balantidium coli* (0.6%) *Trichuris trichura* (0.3%) and *Enterobius* egg (0.3%) (Figure: 1B). With respect to the gender of the study population, there was a noticeable female predominance pattern (56%) compared to male showing 43.92% positivity.

In this study, 22.2% of samples showed the presence of one parasite, 1.46% of the samples showed the presence of more than one parasite and 77.8% of the samples studied showed no parasites (Figure 2). The parasites that were frequently observed in co-infections were *Entamoeba* spp., *Entamoeba coli* and *Blastocystis*.

It was also observed that among the patients with parasitic infection, 52.5% of them showed clinical symptoms such as diarrhoea or dysentery with or without fever, colitis, ulcerative colitis, abdominal pain, etc., correlating to the infection with intestinal parasites. Approximately 47.4% of the patients found to be infected with one or more parasites showed no relevant clinical symptoms or they were said to be asymptomatic.

Intestinal parasites predominates the parasitic infection manifested in human. It is an important public health problem worldwide predominantly in tropics, subtropics and resource-poor settings. Prevalence based studies will aid in conceptualising the spread of these parasites in a better way. In the current study, we report an overall prevalence of 22.21% with prevalence rates differing for individual parasites. It is known that the overall prevalence of these parasites, in India ranges from 12.5- 67% as reported previously (Gang *et al*., 1998).

On the whole, this study reported a higher prevalence of *Entamoeba* spp., (39.7%) that was consistent with the previous reports from Puducherry and South India (Parija & Rao, 1987; Fernandez *et al*., 2002; Dhanabal *et al*., 2014). Amoebiasis caused by *E. histolytica* is the third common parasitic

cause of morbidity and mortality worldwide. Global prevalence of *Entamoeba* spp., ranges from 2- 60% whereas in the Indian scenario, it is 3.6 – 47.4% (Khairnar & Parija, 2002). Previous study apropos the prevalence of parasitic infection in Puducherry region conducted by Parija & Sambasiva Rao in 1987 reported *E. histolytica* (15.06%) to be the prevalent protozoal infection; however according to this finding, the most common parasite in that period was *Ascaris* (Parija & Rao, 1987). The study conducted by Fernandez *et al.,* among children in rural and urban settings of Chennai, also illustrated a higher prevalence of *Entamoeba* spp., (44.9%); whereas, study by Dhanabal *et al*., in the low socioeconomic areas in South Chennai, India showed comparatively lesser prevalence of *Entamoeba* spp.,(21.8%) (Fernandez *et al*., 2002; Dhanabal *et al*., 2014).

Moreover, *Entamoeba* spp., shows a pattern of high prevalence in large cities particularly in the coastal region (Gang *et al*., 1998). Accordingly, the Union territory of Puducherry located in the coastal region of South India also shows a similar pattern of *Entamoeba* spp., distribution. The transmission of *Entamoeba* spp., is through faecal-oral route. Therefore the reason for the higher prevalence of this parasite may be due to contamination of either food or water resources.

The second most common protozoan parasite, as recorded by this study was *Blastocystis* (13.4%). *Blastocystis* is cosmopolitan in distribution and it is one of the most frequent enteric parasites found in human stool samples in developing countries (Parija & Jeremiah, 2013). The worldwide prevalence of *Blastocystis* ranges from 0.5- 62% (Clark *et al*., 2013). In India, a molecular-based study from a healthy population reported 27% prevalence of *Blastocystis* (Pandey *et al*., 2015). However, the studies based on microscopic techniques have reported lesser prevalence rate ranging from 3-8% (Prasad *et al*., 2000; Mohandas *et al.,* 2002). In the present study, *Blastocystis* also observed in co-infection with *Entamoeba* spp., Of the total 32 samples were multiple parasitism was recorded, a maximum number of samples showed the presence of both *Blastocystis* and *Entamoeba* spp., (Figure 2).

Giardia spp., considered to be the most common parasite causing water-borne diarrhoea, was found to be the third common protozoan parasite prevalent in the locality of Puducherry. Globally, the prevalence of *Giardia* spp., ranged from 20-30% (Sadeghi & Borji, 2015) and in India it ranges from 3.8 to 23.5% (Gang *et al*., 1998). In our study population, *Giardia* spp., showed a distribution frequency of about 7.8% followed by *Entamoeba coli* (7.1%). Similar distribution pattern of *Giardia* spp., has been reported by different researchers, elsewhere from India (Rao *et al*., 1977; Ramesh *et al*., 1991). Apart from these common intestinal parasites infecting the human, we have also reported a case of a rare parasitic infection with *Balantidium coli* (Kumar *et al.,* 2016).

Moving to the helminthic infections, in our study, the prevalence of *Ascaris* was 11.34% followed by Hookworm (8.7%), *Strongyloides stercolaris* (5%), *Taenia* (1.2%), *Trichuris trichura* and *Enterobius* (each 0.3%). The global ranking of soil-transmitted helminths (STHs) by WHO, states that *Ascaris* is the most frequent parasite followed by Hookworm and *T. trichura* (http://www.who.int/intestinal_ worms/en/). Considering the prevalence of Ascaris and Hookworm our results were on par with the global ranking, except for *T. trichura* which showed very low prevalence

rate in our study population. Whereas *S. stercolaris*, the fifth major STH, recorded considerably higher prevalence among the samples analysed for this study, compared to *T. trichura*.

In this study, females showed a prevalence rate of 56% for intestinal parasites compared to males (43.9%). Females harbouring larger proportion of parasites than males have been observed in similar studies (Dhanabal *et al.*, 2014). Despite the fact that, the risk of intestinal parasitic infection does not depend on the gender, our study showed a notable predominance pattern in females, that cannot be ignored.

The age-specific prevalence profile of our study population suggests that adults in the age group of 31-40 years were mostly infected with intestinal parasites followed by children of 1-10 years. We could also notice that in patients without any relevant clinical symptoms, the prevalence of enteric parasites was 47.4%. This result probably suggests that there could be a relatively higher number of asymptomatic carriers in this study location that has to be considered for community-based studies. Nutritional grade and immune level of the host determines whether the presence of a pathogenic parasite results in a clinical disease or not.

A notable difference was observed in the distribution pattern of helminths when the present study was compared with the previous study from the same setting by Parija and Sambasiva Rao. *Entamoeba* spp., was the most common protozoan parasite during both the time- periods with approximately 30 years gap between the studies, but the rate of prevalence has drastically increased from 15.06% in 1987 to 39.7% at present. Hookworm was more prevalent during the 1980's (Parija & Rao, 1987); whereas *Ascaris* has shown higher prevalence in the current study.

Fig.1a Frequency of protozoan, coccidian and helminthic parasites

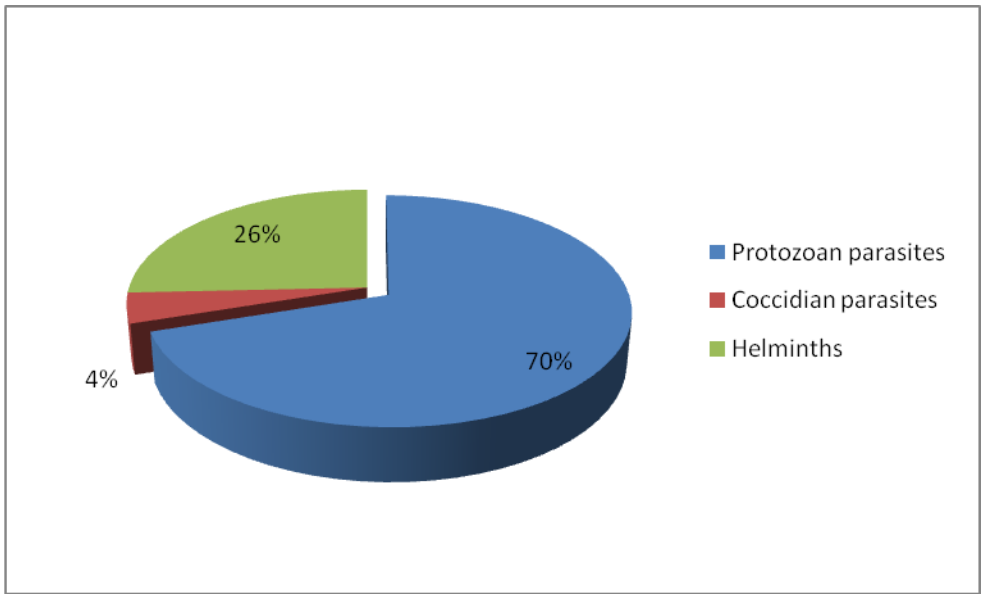


Fig.1b Distribution of intestinal parasites in the study population

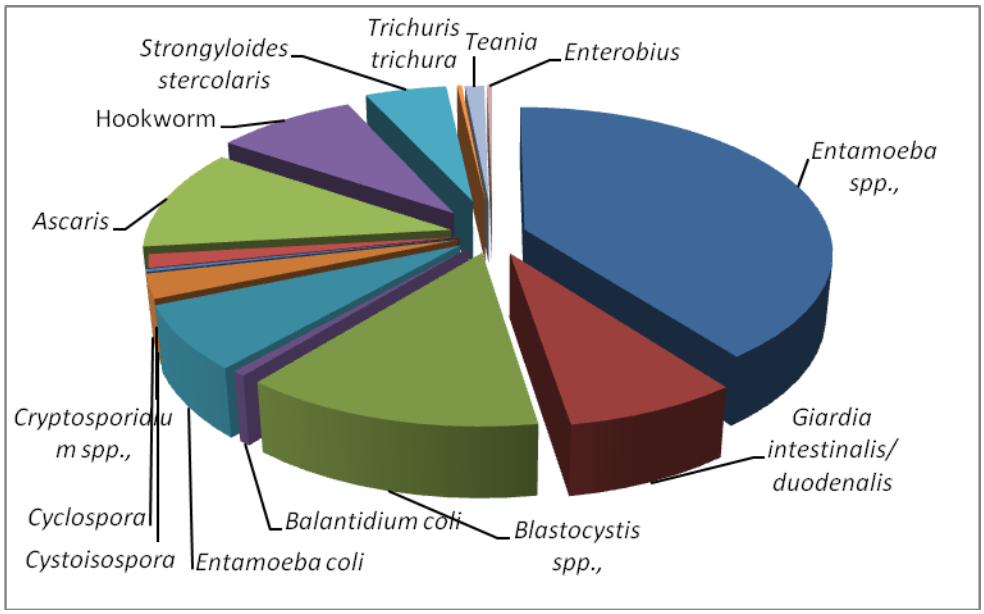
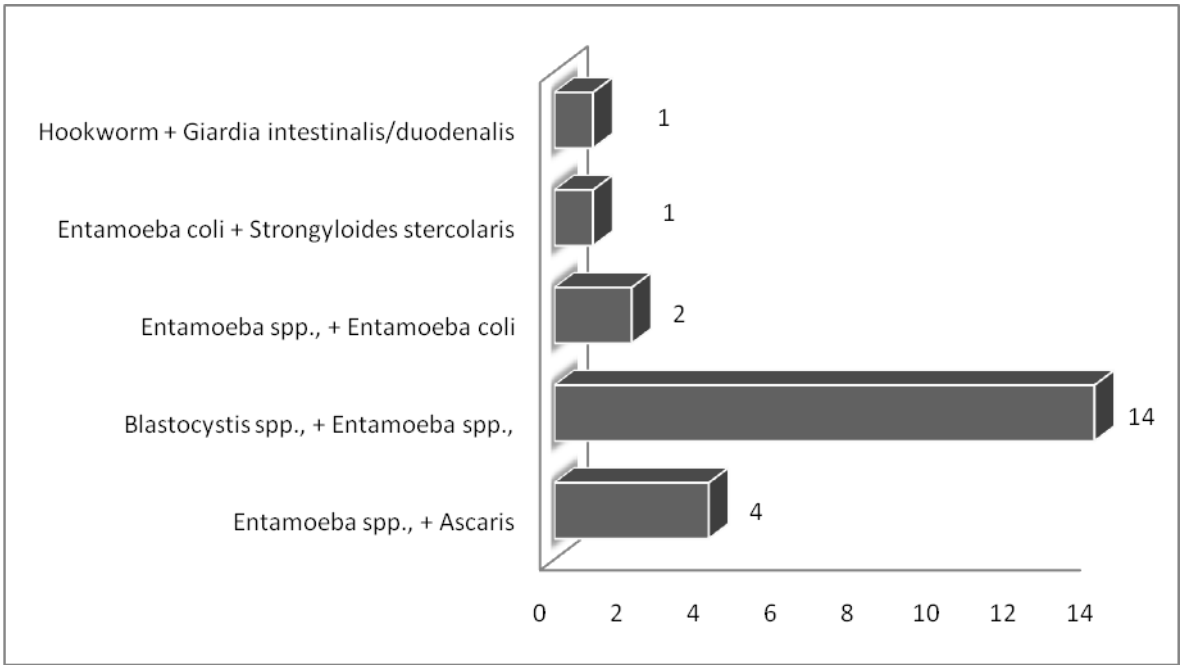


Fig.2 Parasites occurring as co-infections and total number identified in our study population



The limitation of the current study was that examination of a single stool specimen from each participant is not adequate and the methods were not very sensitive. Triple faeces test could have increased the frequency of the parasitic occurrence to some folds compared to that of a single sample. Regarding specificity, the true prevalence of the pathogenic *E. histolytica* and the other look-alike species (*E. dispar* and *E. moshkovskii*) and sub-type analysis for *Blastocystis* could not be determined with the conventional detection methods. For this purpose, molecular analysis based

on nested-multiplex PCR assay has been performed for the samples and the data generated is currently being analysed for sensitivity and specificity. This study did not involve any data related to treatment. Our future perspective is to incorporate treatment options and follow-up after treatment, to determine its efficacy.

To conclude,, this study sheds light on the current pattern of distribution of intestinal parasites, its burden on the health-care system and its deteriorating effect on the society as a whole. This study and similar previous studies suggest that India remains an endemic region for most of these enteric parasitic infections. Understanding the burden of these enteric parasites substantiates the need to determine their public health significance and to devise proper control measures. Apart from early diagnosis and effective treatment, health education, better sanitary management and evidence-based approaches are a pre-requisite to control infections in developing and under-developed nations.

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