

## Prevalence of intestinal parasitic infections among school children and pregnant women in a low socio-economic area, Chandigarh, North India

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### Abstract

Urban slums are well known for their high infant mortality and morbidity rates, and parasitic infections seem to be a common problem among these children. Where as in pregnant women, intestinal parasitic infections (IPI), especially due to helminths, increase anaemia in pregnant women. The aim of the present study was to estimate the prevalence of IPI in the school going children and pregnant women attending the primary health care centres in a low socio-economic area, Chandigarh, North India. Stool samples were collected from 360 children and 87 pregnant women. The stool samples were examined for intestinal parasites by direct microscopic. The prevalence of protozoan infections was much higher than the prevalence of helminth infections. The results indicate that intestinal parasitic infections among school children and pregnant women in the study area are mainly water-borne. The burden of parasitic infestations among the school children, coupled with the poor sanitary conditions in the schools, should be regarded as an issue of public health priority.

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**Keywords:** Intestinal parasitic infections; School children; Pregnant women; *E. histolytica*; India

### Introduction

Intestinal parasitic infections are endemic worldwide and have been described as constituting the greatest single worldwide cause of illness and disease. Poverty, illiteracy, poor hygiene, lack of access to potable water and hot and humid tropical climate are the factors associated with intestinal parasitic infections. Parasitic protozoa and helminths are responsible for some of the most devastating and prevalent diseases of humans. Intestinal parasitic infections (IPI) constitute a global health burden causing clinical morbidity in 450 million people, many of these women of reproductive age and children in developing countries (Quihui, et al., 2006). Indeed, IPIs, mostly helminths, have been linked with an increased risk for nutritional anemias, protein-energy malnutrition and growth deficits in children, low pregnancy weight gain and intrauterine growth retardation followed by low birth weight

(Sackey, et al., 2003, Rodriguez-Morales, et al., 2006). Intestinal helminthic infestations are most common among school age children, and they tend to occur in high intensity in this age group (Savioli, et al., 1992, Albonico, et al., 1999). Like other developing countries, intestinal parasitic infections are a major health problem in India. In previous studies conducted in low-socio economic areas in and around Chandigarh, reported the prevalence of intestinal parasitic diseases ranging from 14.6-19.3% (Bansal, et al., 2004, Khurana, et al., 2005). Recently in one of the studies in children from rural as well as urban areas of the Kashmir valley, India, it has been reported that at least one intestinal helminth was found in 71.2 % of the sampled population. The prevalence of *Ascaris lumbricoides* was highest (68.3%), followed by *Trichuris trichiura* (27.9%), *Enterobius vermicularis* (12.7%) and *Taenia saginata*

(4.6%) (Wani, et al., 2008). Therefore, it is important to monitor the problem time to time and tackle it in the interest of public health. Intestinal parasitic infections, especially due to helminths, increase anemia in pregnant women. The results of this are low pregnancy weight gain and intra uterine growth retardation, followed by low birth weight, with its associated greater risks of infection and higher prenatal mortality rates. An estimated 44 million pregnant women have hookworm infections which can cause chronic loss of blood from the intestines and predisposes the women to developing iron deficiency anemia (Brooker, et al., 2008). There is a necessity to study the prevalence of the parasitic infections in pregnant women to decrease the risk for both mother as well as child. The aim of the present study was to determine the prevalence of intestinal parasitic infections among 8-13 years old school children and in pregnant women in the slum areas, in and around Chandigarh and to identify the associated socio-demographic and environmental factors, behavioural habits and also related complaints.

## Materials and methods

This cross-sectional study was carried out from October-November, 2007. The study population consist of primary school children (n=360) and pregnant women (n=87). Meetings with personnel from the boarding schools and a primary health care centres were carried out in order to explain the study protocol. Participants were selected from the list of students from each of the selected boarding schools, which included names and date of birth. One hundred and seventy-five girls (48.6%), 185 boys (51.3%) and 87 pregnant women were enrolled in this study. Oral consent was taken from parents in order for their child to participate in the study and pregnant women who were visiting the primary health centre. Baseline data were collected using a structured questionnaire and laboratory analysis of faecal samples. Subjects received oral and written notification of test results. Plastic containers with identification numbers and names were distributed to all the children and pregnant women, which were used to collect stool sample from each individual. Information about name, sex, age, school grade and the result of stool examination for each child was recorded on the stool examination forms by the field workers. Microscopic examination of the stool samples for cysts and ova of intestinal parasites by direct wet smear was performed within 12 hours at the department of Parasitology, the Postgraduate Institute of Medical Education and Research, Chandigarh, India. DNA was isolated from microscopically positive

*Entamoeba histolytica/Entamoeba dispar* stool samples. In brief, 200 µl of faeces suspension (~ 0.5 g/ml of phosphate-buffered saline containing 2% polyvinylpyrrolidone [Sigma]), purified parasites were heated for 10 min at 100°C. The suspensions were treated with sodium dodecyl sulfate-proteinase K for 2 h at 55 °C. DNA was then isolated using QIAamp Tissue Kit spin columns (QIAGEN, Hilden, Germany). In each sample, 10<sup>3</sup> PFU of phocin herpesvirus 1 (PhHV-1) per ml was added to the isolation lysis buffer to serve as an internal control (Niesters, 2002). The DNA samples were transported to the Leiden University Medical Centre, The Netherlands for *E. histolytica*- and *E. dispar*-specific multiplex real-time PCR. *E. histolytica*- and *E. dispar*-specific multiplex real-time was performed as described previously (Verweij, et al., 2003). In brief, *E. histolytica/E. dispar*-specific PCR primers were used to amplify a 172-bp fragment inside the SSU rRNA gene. The *E. histolytica*- and *E. dispar*-specific minor groove binding (MGB) TaqMan (Applied Biosystems) probes were used to detect *E. histolytica* and *E. dispar* specific amplification, respectively. The number of samples to be included in the study was determined by calculating the power (0.80) of the samples size. Data was analysed by using SPSS 12 version statistical software. The results were expressed as rates and proportions. Chi square test of statistical significance was applied to study the association between prevalence of intestinal parasites and the demographic factors. P value <0.05 was considered as significant.

## Results and Discussion

The results of microscopy and real-time PCR for all faecal parasites are summarised in table. Intestinal parasites were detected by direct smear in 154 of 360 (42.8%) primary school children. At least one intestinal parasite was found in stool samples from 124 (34.4%) children, two parasites in 27 (17.5%), and mixed infections with 3 parasites were seen in stool samples of 3 children (1.9%). Intestinal parasites were detected by microscopy in 32 of 87 pregnant women enrolled in this study. Among these, 28 (32.2%) were infected with at least one parasite and 4 (4.6 %) with more than 2 parasites. *E. histolytica*-specific amplification was detected in 4 of 23 DNA samples, and *E. dispar*- specific amplification was detected in 14 of 23 DNA samples. Five DNA samples did not show *E. histolytica*- or *E. dispar*-specific amplification; only amplification of the internal control was detected, at the expected threshold cycle of approximately 33. In the present study, intestinal parasites were found in almost half of

**Table 1.** Prevalence of intestinal parasitic infections using microscopy and *E. histolytica*/*E. dispar* specific real-time PCR in pregnant women and school children in Indira colony, Chandigarh, India.

Intestinal Parasitic infection	School children (N=360)	Pregnant women (N=87)
<b>Protozoa</b>		
<i>Giardia intestinalis</i>	77 (21.4)	6 (6.9)
<i>Entamoeba histolytica</i> / <i>E. dispar</i>	19 (5.3)	4 (4.6)
<i>Entamoeba coli</i>	36 (10)	10 (11.5)
<i>Trichomonas hominis</i>	0	2 (2.3)
<i>Blastocystis hominis</i>	0	3 (3.4)
<i>Iodamoeba</i>	0	1 (1.1)
<b>Helminths</b>		
<i>Hymenolepis nana</i>	22 (6.1)	1 (1.1)
<i>Ascaris lumbricoides</i>	0	3 (3.4)
<i>Taenia spec</i>	0	1 (1.1)

the primary school children. *G. intestinalis* (21.4%), *E. coli* (10%) and *H. nana* (6.1%) were the most common parasitic infections detected in children. There was no significant difference in prevalence of intestinal parasites according to age and gender of the school children (data not shown). Especially the prevalence of intestinal protozoa found in this study was higher than previous studies conducted in this area (Bansal, et al., 2004, Khurana, et al., 2005). This is in contrast with the few reports conducted in other parts of India (Awasthi and Pande, 1997, Fernandez, et al., 2002, Wani, et al., 2007) where a higher prevalence of helminthic infections than protozoan infections was reported. In India, the highest prevalence of intestinal parasitic infections (91%) in school going children was reported in rural settings in and around Chennai, South India (Fernandez, et al., 2002). In India, reports on the prevalence of intestinal parasitic infections in pregnant women are lacking. In the present study, total prevalence of intestinal parasitic infections was found to be 35.6% in pregnant women attending to the primary health care centres. Protozoan parasitic infections were significantly higher (81.2%) than the intestinal helminthic infections (18.8%), which is in contrast to reports in other parts of the world (Steketee, 2003, Rodriguez-Morales, et al., 2006). The results of the present study indicate that pregnant women in Chandigarh are more likely to be infected with the common waterborne intestinal parasites than with helminths. However, these studies focused on different populations and the present study is in school children & pregnant women. This could be the reason for the difference in prevalence of parasites.

The prevalence of *E. histolytica* found in the present study of one percent was based on microscopy

positive samples only. Presumably, the number of *E. histolytica* positive cases would be higher if all samples were tested by real-time PCR. The ratio of *E. histolytica* to *E. dispar* found in this study of 1:3.5 is higher than the estimated global ratio of 1:10.

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