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Parasitic Infestation Among Urban and Rural Teenage Girls of Davangere District, Karnataka

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Parasitic disease is major public health problem globally with intestinal parasites being most common in developing countries; in both rural and urban communities and in very poor people. Worm infestation is one of the major cause of childhood malnutrition, anaemia, stunted physical and mental growth, psycho-social problems. Comparison of prevalence of parasitic infestation and optimization of number of stool samples for screening of parasitic infestation among rural and urban teenage girls (12-19 years) of district Davangere. The study was conducted among school going teenage girls (12-19 years) from rural and urban areas of Davangere district, Karnataka. 1180 stool samples were screened for the presence of any intestinal parasites. The results revealed that 44.9% teenage girls had worm infestation. The prevalence of parasitic infestation was high among rural teenage girls (65.9%) as compared to the urban teenage girls (34.9%). The most common parasites were *Ancylostoma duodenale* (44.7%) and *Ascaris lumbricoides* (23.4%). The high prevalence of parasitic infestation seems directly related to the unhygienic living conditions associated with lack of knowledge about parasitic diseases. Amongst the intervention measures, it is important to take up sustained health education about parasitic infestation, provision of safe drinking water and improvement in environmental sanitation.

Key words: Intestinal parasites, Teenagers, Rural, Urban.

Intestinal parasites are widely prevalent in developing countries, probably due to poor sanitation and inadequate personal hygiene[1]. It is estimated that as much as 60% of the world's population is infected with gut parasites, which may play a role in morbidity due to intestinal infections. The commonest parasitic infections reported globally are *Ascaris lumbricoides* (20%), *Ancylostoma duodenale* (18%), *Trichuris trichura* (10%), and *Entamoeba histolytica* (10%)[2]. In India overall prevalence rates range from 12.5% to 66%, with varying prevalence rates for individual parasites[3,4,5,6]. However, most reports are based on single samples from a variety of patient groups and controls, and the community prevalence has not been documented in detail. We now report a detailed analysis of the prevalence of potentially pathogenic intestinal parasites in rural and urban teenage girls at Davangere, Karnataka and to estimate the optimum number of stool samples which should be examined to give reliable and reproducible results.

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MATERIAL AND METHODS

Type of study

Cross-sectional.

Study area

Thirteen schools were selected from rural and urban areas in and around Davangere district, Karnataka.

Period of study

July 2006 " June 2008.

Sample size

A school based cross-sectional study was conducted through a pretested, semi structured interview schedule in rural and urban areas of Davangere. A total of 1180 samples between the age group of 12 to 19 years participated in the study.

Selection of the study subjects

Only those schools who gave us the permission to carry out this study were included.

Inclusion and exclusion criteria

The rural schools cater to low socioeconomic group of population. The schools in urban areas included government and private schools catering to middle and high socioeconomic group. The age of children was ascertained by questioning them and later confirmed from school registers in case of any discrepancy between the two, the date in the school register was taken as accurate. Age in completed years was taken for analysis. None of these individuals had any gastrointestinal symptoms during the period of sample collection.

Ethical clearance

Ethical clearance was obtained from the institute. Informed written consent was taken from all students and their guardians for interview and sample collection.

Stool samples

3 stool samples per student were collected in seven days of intervals. Stool samples were collected in a plastic disposable container containing 1ml of 10% formalin and transported to the laboratory without delay.

Examination for parasites

Saline and iodine preparations from each sample before and after formal-ether concentration were examined under 100x and 400x magnification[7]. After concentration a smear was made and stained with safranine methylene blue stain for *Cryptosporidium* and examined under an oil-immersion lens (total magnification 1000x)[8].

RESULTS

Out of 1180 subjects in the study population, majority were early adolescents. Majority girls belonged to families with lower income group. One or more potentially pathogenic parasites were found in 520 subjects. Multiple infestations were seen in 10 subjects. Nine potentially pathogenic parasites, 3 protozoans; *Entamoeba histolytica* (1.5%), *Giardia lamblia* (4.0%) and *Cryptosporidium* (1.5%) and 6 helminths; *Ancylostoma duodenale* (44.7%), *Ascaris lumbricoides* (23.4%), *Hymenolepis nana* (1.6%), *Trichuris trichura* (8.3%) and *Enterobius vermicularis* (14.7%) were identified (Table-1).

The overall prevalence of worm infestation among adolescents is 44.9%. The prevalence of parasitic infection was significantly higher ($p<0.01$) amongst rural girls (65.9%) as compared to the urban (34.9%) (Table 2). Worm infestation was significantly more in poor children than in middle income or high income.

Frequency of observation of parasitic infestation in three different stool samples is depicted in table 3. Nearly 78.1% of the parasites were identified in the first stool sample and 90.9% were identified by the 2nd stool sample and virtually all the parasites listed in table-1 were identified in the third sample.

Table 1. Worm infestation among Rural and Urban teenage girls

Parasites	Number (%)
Protozoa	37 (7.0)
Entamoeba histolytica	08 (1.5)
Giardia lamblia	21 (4.0)
Cryptosporidium sps	08 (1.5)
Helminthic eggs	493 (93.0)
Ancylostoma duodenale	237 (44.7)
Ascaris lumbricoides	125 (23.4)
Trichuris trichura	44 (8.3)
Enterobius vermicularis	78 (14.7)
Hymenolepis nana	09 (1.6)
Total	530

The commonest parasites identified among urban teenage girls were *Ascaris lumbricoides* in 71(38.4%) subjects, *Ancylostoma duodenale* in 52 (28.1%), *Trichuris trichura* in 26 (14.1%), *Enterobius vermicularis* in 18 (9.7%), *Giardia lamblia* in 07 (3.8%), *Hymenolepis nana* is 05 (2.7%), *Cryptosporidium* in 04 (2.2%), and *Entamoeba histolytica* in 02 (1.1%) (Table-2). Of these, *Ancylostoma duodenale* and *Ascaris lumbricoides* infestation was commoner in the older children. *Trichuris trichura*, *Enterobius vermicularis* and *Cryptosporidium* infections were more common in the children age group 12 & 13.

Among rural teenage girls *Ancylostoma duodenale* was seen in 185 (53.6%), followed by *Enterobius vermicularis* in 60 (17.4%), *Ascaris lumbricoides* in 54 (15.7%), *Trichuris trichura* in 18 (5.2%), *Giardia lamblia* in 14 (4.1%), *Entamoeba histolytica* in 6 (1.7%) and *Cryptosporidium* and *Hymenolepis nana* were seen in 04 (1.2%) respectively (Table 2).

Table 2. Comparison of Incidence of worm infestation among Rural and Urban teenagers

Parasites	Rural Number (%)	Urban Number (%)	Total Number (%)
Protozoa	24 (6.9)	13 (7.0)	37 (7.0)
Entamoeba histolytica	06 (1.7)	02 1.1)	08 (1.5)
Giardia lamblia	14 (4.1)	07 (3.8)	21 (4.0)
Cryptosporidium sps	04 (1.2)	04 (2.2)	08 (4.0)
Helminthic eggs	321 (93.0)	172 (92.9)	493 (93.0)
Ancylostoma duodenale	185 (53.6)	52 (28.1)	237 (44.7)
Ascaris lumbricoides	54 (15.7)	71 (38.4)	125 (23.4)
Trichuris trichura	18 (5.2)	26 (14.1)	44 (8.3)
Enterobius vermicularis	60 (17.4)	18 (9.7)	78 (14.7)
Hymenolepis nana	04 (1.2)	05 (2.7)	09 (1.6)
Total	345 (65.9)	185 (34.9)	530 (44.9)

Table 3. Frequency of observation of parasitic infestation in three different stool samples

Parasites	Sample-1	Sample-2	Sample-3
Protozoa			
Entamoeba histolytica	04	08	08
Giardia lamblia	17	20	21
Cryptosporidium sps	02	05	08
Helminthic eggs			
Ancylostoma duodenale	175	213	237
Ascaris lumbricoides	125	125	125
Trichuris trichura	40	44	44
Enterobius vermicularis	42	58	78
Hymenolepis nana	09	09	09
Total	414	462	530

DISCUSSION

In developing countries most people live without access to proper sanitation facilities and are unaware of the importance of basic hygiene practices like hand washing after visiting toilet. Worm infestation is related to poor sanitation and lack of clean drinking water[9,10,11,12]. This study shows a much higher prevalence of intestinal parasites than previously reported from the Indian

subcontinent. However, the number of stool samples examined is also much higher than in any other study. Most of these reports were based on single sample per subject at the most, and while this may be appropriate when there are manifest gastrointestinal symptoms, it may be inadequate when intensity of infection is low and no symptoms are present. The data shown in table-3, show that by the 1st sample, nearly 78.1% of the potential carriers are identified and 90.9% identification done by the 2nd sample and virtually all the parasites listed in table-1 were identified in the 3rd sample In this asymptomatic population, 95% confidence of detection is achieved by examining 3 stool samples. This highlights the need for repeated sampling in order to determine accurate prevalence rates in any population. The costs of such detailed studies have to be balanced against the potential gain in sensitivity and is likely to be acceptable in research situations only. The intermittent nature of parasite detection probably reflects the low density of parasite load in this asymptomatic group. In clinical practice, 2 stools samples should give a sensitivity of more 90.9%.

Dual parasites were seen in 10 individuals in the present study and similar was reported in other studies where 4 children had 2 parasites[13,14] and one had three parasites[15]. In some other multiple parasite infestation was also observed[16,17,18].

When the excretion of parasites by individual subjects is considered as in table 3, it is interesting to note that for 2 of the 4 most commonly encountered parasites, subjects fall into 2 groups. One group excretes the parasite in one of the three samples (infrequent excretors), whereas the other excretes parasites in over more than a two of their samples (frequent excretors). This is seen with both protozoan parasites, as in *Giardia lamblia*, as well as with helminths such as *Ancylostoma duodenale* and *Hymenolepis nana*. However, the asymptomatic subjects with *Cryptosporidium* all showed very infrequent excretion of Oocysts. Based on these findings, it is possible that excretion of parasites by an individual is a host characteristic determined by the response of the host's immunological defence mechanisms to the parasite. Infrequent excretors may be those subjects with a high level of resistance to the parasite[19,20]; in whom replication of the parasite is prevented to some extent. The lack of frequent excretors of *Cryptosporidium* could then be because replication of this parasite above a critical level would result in diarrhoea.

Striking differences in the prevalence of intestinal pathogens are seen when available reports from the Indian subcontinent were examined. In several of these studies only a single stool sample was examined and parasite prevalence rates ranged from 12.5% - 67% with prevalence rates for individual parasites varying widely between studies[21,22]. *Entamoeba histolytica* appears to have the highest prevalence in urban teenagers. The prevalence of *Giardia lamblia* appears to parallel with *Entamoeba histolytica* in the present study. Unfortunately our study does not corroborates with other studies[23,24] because, similar techniques of sampling and laboratory methodology have not been used in these studies[24,25] and we cannot draw meaningful conclusions about geographical differences.

The prevalence of worm infestation among rural girls were 65.9% compared to 34.9% in urban teenage girls. The high prevalence rate of worm infestation in rural teenage girls is attributed to the unprotected water supply and the defecation practices of the rural area of Davangere. Defecation occurs in the surrounding fields and the stools are exposed to scavenging animals and the drying effects of the sun and wind. Animals and wind have been proposed as sources of water supply contamination, and of direct infection[26].

The age specific prevalence rates of *Enterobius vermicularis*, *Giardia lamblia*, *Cryptosporidium* and *Ancylostoma duodenale* reflect their modes of transmission. *Giardia lamblia* and *Cryptosporidium* are transmitted by the feceal-oral route and are commoner in children. In the present study incidence of *Enterobius vermicularis*, *Giardia lamblia*, and *Cryptosporidium* was high in the age group of 12-14 years. The lower prevalence among 15 to 19 years suggests, acquired immunity after repeated infections[27]. Hookworm infestation results from penetration of the skin by filiform larvae and is mainly seen in older age groups who are more likely to be exposed to the larvae while walking barefoot. Hook worm infestation was high (53.6%) in rural teenage girls[28,29]. In this study, although there was no demonstrable effect on the health of the

subjects in the form of symptomatic disease, the observation that subjects in the same environment can excrete parasites with high or low frequency indicates that host-related factors probably determine parasite excretion rates. Acute infectious diarrhoea is likely to be the result of an alteration of the environment of the gut associated with presence of a pathogenic organism and a better understanding of gut ecology may help in devising optimum methods of control.

The high prevalence of parasitic infestation seems directly related to the unhygienic living conditions associated with lack of knowledge about the communicable disease and variety of allied factors, which need to be studied. Amongst the intervention measures, it is important to take up sustained health education, provision of safe drinking water and improvement in environmental sanitation. It would be also useful to teach them about personal hygiene and conduct health education at schools through "School Health Projects". During the school health check ups, periodic screening for intestinal parasites can be evaluated.

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