Prevalence of ancylostomiasis in people living in slum area, Philhousepet of Eluru, West Godavari District (Andhra Pradesh)

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Abstract Hookworm infection was found in the slum area of Eluru, West Godavari District, A.P. which has scheduled caste population. Infection is related to different climatic conditions and socio-economic status of the population. The inhabitants are coolies in agricultural fields and household workers with a poor level of hygiene and sanitation. All the infected positive cases showed *Ancylostoma duodenale* infection. The prevalence of hookworm infection was 15.6, 17.9 and 14 % in children, 23.5, 27.9 and 20.5 % in adults during summer, rainy and winter seasons respectively. Single species infection was studied in three periods. Out of 264 faecal samples, 128 children (40 males, 32.5 %) and 136 adults (64 men, 25 % and 72 women, 30.5 %) showed helminthic infection in rainy season. Much variation is seen in the prevalence of disease in rainy and winter seasons in all the age groups. The infected individuals were treated with albendazole just after rainy season. Three weeks after antihelminthic treatment, the infection rate among them was lowered; health education also plays a role in reducing the % of infection.

Keywords Hookworm infection · Philhousepet · Eluru

Introduction

Tropical and sub tropical countries are showing the prevalence as high as 95 % of hookworm infection (Hoagland and Schad 1978; Walsh and Warren 1979). Hookworm

infection may lead to iron deficiency anaemia (Roch and Layrisse 1996; Woodruff 1982). Hookworm infection alone may cause 50,000 deaths per year worldwide (Waldane 1991). *Necator americanus* and *Ancylostoma duodenale* occur commonly in tropical and sub-tropical regions; *A. duodenale* has been reported to be the common infection in rural communities (Gallies 1985; WHO 1994). Protein, folic acid and vitamin B12 deficiencies due to hookworm infection may cause mortality and/or retarded growth in children (Li 1990; Hotez and Pritchard 1995; Stoltfus et al. 1997). Hookworm infection is also a major concern for women's health (WHO 1994). The intensity of hookworm infection is directly related to anaemia (Lwambo et al. 1992). Climate, socio-economic, educational, environmental and sanitary conditions may influence the prevalence and severity of hookworm infection in varied age and sex of the host (Kan 1989; Bakta et al. 1993).

Information regarding the hookworm infection in South India is lacking. The clinical significance of the hookworm infection and related blood loss may vary (Gallies et al. 1964; WHO 1981). *A. duodenale* is more common in southern Europe, Northern India, Northern China and Pakistan (Beaver et al. 1984). Research on hookworm infection and on details of blood loss should be taken up to understand the importance of human health (WHO 1981). Anjum (2007a) reported a significant relation between M.C.H.C level hookworm infection burden. Maximum prevalence of *N. americanus* was found in four districts of West Bengal (Pal and Rana 1983). Studies on the correlation of hookworm infection and packed cell volume in a rural population of Pakistan showed 25.05 % of hookworm positive cases (Anjum 2007b). The efficiency of 400 mg single dose of albendazole among different hookworm infected racial/ethnic groups was analyzed 21 days post-treatment; lower cure rates were obtained in moderate to

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heavy infections (56.3 %) and higher rates for light infections (63.6 %) among the positive cases (Anantaphruti et al. 2007). The impact of helminths and co-infection may not increase the prevalence of allergy and other ill effects (Chijioke and Michael 2008). Houseflies acts as potential transmitters to helminthiasis in an unsanitary community (Maipanich et al. 2008). Therefore, a new vista has been opened to survey the hookworm infection in the rural people living in Philhousepet.

Materials and methods

The study area is located about 5 km of Eluru Municipal Corporation (West Godavari District). All the 272 inhabitants belong to scheduled caste. The ecosystem basis of the area is paddy fields but most of them are coolies and household workers. This area is having a municipal school; most of the children go to that school up to primary standard, while the adults are uneducated. The level of hygiene and sanitation is very poor. About 60 % of houses are provided with latrines but all the people defecate in open fields and behind the house yards. Water supply to houses is not available. A common community water tap or open wells are the sources of water.

Survey and analysis

At the beginning of the study, village programmes were initiated to create awareness among the people.

Sample size. Data on prevalence of helminthic diseases was not available from the present study area. The population was about 272 with 53 households in Philhousepet.

Sampling design. The stool samples were collected from 264 subjects having 128 children (40 males and 88 females) and 136 adults (64 males and 72 females) of Philhousepet. Data was also collected on the living conditions of the infected individuals.

Stool sample collection

The procedure adopted for collection and examination of fecal samples is described as given in previous paper (Indira and Vardhani 2009) (Fig. 1).

Epidemiological survey was carried out from March 2004 to April 2005 (on alternate days within 10 day period). The prevalence of infection was recorded in summer (March–June, 2004), rainy (July–October 2004) and winter (November 2004–February 2005) seasons. After the survey in rainy season, the infected individuals were tested with a single dose of albendazole (500 mg) under the supervision of the Government medical practitioner. The occurrence of infection was again tested after 3 weeks period.

Fig. 1 Eggs of *A. duodenale* in 4–8 cell stage

Results

Prevalence of helminthic infection in summer season

Out of 128 children (Table 7) 30.0 % males, 9.0 % females were infected with *A. duodenale*. Males of 5–9 and 10–19 age groups lodged of 33.3 and 40.0 % infection; while the 0–4 age group children were free from helminthic infection.

Males of 20–29, 30–39 and above 60 years age groups had higher prevalence of *A. duodenale* (33.3, 20 and 33.3 %), 40–49 and 50–59 age groups were safe from the risk of helminthic infection (Table 1). *A. duodenale* was the most predominant parasite detected in Philhousepet with a prevalence rate of 23.5 % in adults (Table 2).

Prevalence of helminthic infections in rainy season

Of 128 children (40 males and 88 females), males of 5–9 and 10–19 years showed 41.6 and 40 % of infection respectively (Table 3), while 0–4 years were free from helminthes. Females of 0–4 and 10–19 age groups showed 8.3 and 22.5 % respectively and 5–9 year group did not lodge infection.

Of 136 adults examined, males and females showed 25 and 30.5 % infection respectively (Table 4). Males of 20–29 age group has higher prevalence of *A. duodenale* (100 %) 30–39, 40–49 and >60 years showed 25, 6.2 and 50.0 % of infection respectively. 50–59 years were found negative for helminthic infection. Females of 20–29, 30–39, 50–59 and >60 years showed 41–6, 30, 41.6 and 12.5 % of infection respectively. While 40–49 years were free from the risk of infection.

Table 1 Prevalence of *A. duodenale* among children of Philhousepet in Eluru town according to age and sex in summer season

Sex	Age in years			Total			
	0–4	5–9	10–19				
Boys	0 % (8)	33.3 % (12)	40 % (20)	30.0 % (40)			
Girls	0 % (12)	0 % (36)	20 % (40)	9.0 % (88)			
Total	0 % (20)	8.3 % (48)	26.6 % (60)	15.6 % (128)			
Helminthic infections	Prevalence %						Total
	Males			Females			
	0–4	5–9	10–19	0–4	5–9	10–19	
<i>A. duodenale</i>	0 % (8)	33.3 % (12)	40 % (20)	0 % (12)	0 % (36)	20 % (40)	15.6 % (128)

Number in *parenthesis* indicates the sample size

No. of children tested, 128

No. of children infected, 20

% of infection, 15.6 %

Table 3 Prevalence of *A. duodenale* among children of Philhousepet in Eluru town according to age and sex in rainy season

Sex	Age in years			Total			
	0–4	5–9	10–19				
Boys	0 % (8)	41.6 % (12)	40 % (20)	32.5 % (40)			
Girls	8.3 % (12)	0 % (36)	22.5 % (40)	11.3 % (88)			
Total	5.0 % (20)	10.4 % (48)	28.3 % (60)	17.9 % (128)			
Helminthic infections	Prevalence %			Total			
	Males		Females				
	0–4	5–9	10–19				
<i>A. duodenale</i>	0 % (8)	41.6 % (12)	40 % (20)	8.3 % (12)	0 % (36)	22.5 % (40)	17.9 % (128)

Number in *parenthesis* indicates the sample size

No. of children tested, 128

No. of children infected, 23

% of infection, 17.9 %

Prevalence of helminthic infection in winter season

Of 128 children (Table 5) tested, males of 5–9 age group (33.3 %) and 10–19 age group (30.0 %) were found infected with single species of hookworm while 0–4 years were free

of infection. Females of 10–19 years age group showed 20 % of infection, the age group of 0–4 and 5–9 years were found negative for helminthic infection (Table 6).

Table 2 Prevalence of *A. duodenale* among adults of Philhousepet in Eluru town according to age and sex in summer season

Sex	Age in years					Total					
	20–29	30–39	40–49	50–59	>60						
Men	100 % (4)	28.5 % (28)	0 % (16)	0 % (8)	50 % (8)	25 % (64)					
Women	33.3 % (24)	20 % (20)	0 % (8)	33.3 % (12)	0 % (8)	22.2 % (72)					
Total	42.8 % (28)	25 % (48)	0 % (24)	20 % (20)	25 % (16)	23.5 % (136)					
Helminthic infections	Prevalence %										Total
	Males					Females					
	20–29	30–39	40–49	50–59	>60	20–29	30–39	40–49	50–59	>60	
<i>A. duodenale</i>	100 % (4)	28.5 % (28)	0 % (16)	0 % (8)	50 % (8)	33.3 % (24)	20 % (20)	0 % (8)	33.3 % (12)	0 % (8)	23.5 % (136)

Number in *parenthesis* indicates the sample size

No. of adults tested, 136

No. of adults infected, 32

% of infection, 23.5 %

Over all percentage in Philhousepet = 19.6 %

Table 4 Prevalence of *A. duodenale* among adults of Philhousepet in Eluru town according to age and sex in rainy season

Sex	Age in years					Total					
	20–29	30–39	40–49	50–59	>60						
Men	100 %	25 %	6.2 %	0 %	50 %	25 %					
	(4)	(28)	(16)	(8)	(8)	(64)					
Women	41.6 %	30 %	0 %	41.6 %	12.5 %	30.5 %					
	(24)	(20)	(8)	(12)	(8)	(72)					
Total	50 %	27 %	4.5 %	25 %	31.2 %	27.9 %					
	(28)	(48)	(24)	(20)	(16)	(136)					
Helminthic infections	Prevalence %					Total					
	Males										
	Females										
	20–29	30–39	40–49	50–59	>60	20–29	30–39	40–49	50–59	>60	
<i>A. duodenale</i>	100 %	25 %	6.2 %	0 %	50 %	41.6 %	30 %	0 %	41.6 %	12.5 %	27.9 %
	(4)	(8)	(16)	(8)	(8)	(24)	(20)	(8)	(12)	(8)	(136)

Number in *parenthesis* indicates the sample size

No. of adults tested, 136

No. of adults infected, 38

% of infection, 27.9 %

Over all percentage in Philhousepet = 23.1 %

The prevalence of infection was found to be low in adults when compared to other seasons and before treatment. Males of 20–29, 30–39 and >60 years showed 75, 21.4 and 37.5 % infection respectively (Table 7). The age

groups of 40–49 and 50–59 were found free of infection. Females of 20–29, 30–39 and 50–59 age groups showed 33.3, 20.0 and 33.3 % infection respectively. While 40–49 and >60 showed no infection.

Table 5 Prevalence of *A. duodenale* among children of Philhousepet in Eluru town according to age and sex in winter season

Sex	Age in years			Total
	0–4	5–9	10–19	
Boys	0 % (8)	33.3 % (12)	30 % (20)	25 % (40)
Girls	0 % (12)	0 % (36)	20 % (40)	9 % (88)
Total	0 % (20)	8.3 % (48)	23.3 % (60)	14 % (128)
Helminthic infections	Prevalence %			Total

Number in *parenthesis* indicates the sample size

No. of children tested, 128

No. of children infected, 18

% of infection, 14 %

Season-wise prevalence

Incidence of ancylostomiasis was higher in all the age groups in rainy season when compared to summer season (Table 7); this could be due to higher exposure stress. Comparatively lower incidence of ancylostomiasis was noticed in all the age groups in winter season.

Discussion

Hence, intestinal parasitism represents a major public health problem. Majority of population in India belongs to the lower socio-economic group; The present study on the estimation of the prevalence of various intestinal parasitic infestation reveals that in rural slums, the prevalence rate of intestinal parasites can reach as high as 67–100 %. Scarcity of basic infrastructure, unhygienic environment, consumption of improperly cooked contaminated food and contaminated water may contribute to high prevalence of intestinal parasites as suggested by Fernandez et al. (2002) in rural children living in and around Chennai. The high prevalence of *A. duodenale* in the study area shows the

Table 6 Prevalence of *A. duodenale* among adults of Philhousepet in Eluru town according to age and sex in winter season

Sex	Age in years					Total
	20–29	30–39	40–49	50–59	>60	
Men	75 % (4)	21.4 % (28)	0 % (16)	0 % (8)	37.5 % (8)	18.75 % (64)
Women	33.3 % (24)	20 % (20)	0 % (8)	33.3 % (12)	0 % (8)	22.2 % (27)
Total	39.2 % (28)	20.8 % (48)	0 % (24)	20 % (20)	18.7 % (16)	20.5 % (136)

Helminthic infections	Prevalence %										Total
	Males					Females					
	20–29	30–39	40–49	50–59	>60	20–29	30–39	40–49	50–59	>60	
<i>A. duodenale</i>	75 % (4)	21.4 % (28)	0 % (16)	0 % (8)	37.5 % (8)	33.3 % (24)	20 % (20)	0 % (8)	33.3 % (12)	0 % (8)	20.5 % (136)

Number in *parenthesis* indicates the sample size

No. of adults tested, 136

No. of adults infected, 28

% of infection, 20.5 %

Over all percentage in Philhousepet = 17.4 %

poor proper personal and community hygiene. The habit of leaving faeces behind their houses led to the pitiable condition of unhygienic environment in the slum area.

In the present study, 0–4 and 40–49 age groups were free of ancylostomiasis in summer and winter seasons in Philhousepet. *A. duodenale* was recorded in all the infecting children and adults in this slum. The prevalence of hookworm infection in the present study was found to be higher in male children and male adults than in female children and female adults. This may be related to their social habits of the slum people; the male folk work more in the fields and outdoors, and therefore, are prone to heavy

infection as compared to females. The prevalence of ancylostomiasis in this slum related to the status of personal hygiene practiced in the females.

In summer season

The % of prevalence of ancylostomiasis was found to be low in non tribals of Philhousepet slum. 40–49 and 50–59 age groups were safe from the risk of helminthic infection.

In rainy season

The age group (males) of 5–9 and 10–19 years were identified as high risk groups lodging 41.6 and 40.0 % infection. These observations are similar to those of Larisha et al. (2002) who also found the age groups of 5–9 and 10–14 as high risk age groups for *A. duodenale* infection.

In winter season

It is interesting to note that in both children and adults the % of infection showed declined by winter season. The control of hookworm infection in the study area was achieved with health education together with good hygiene.

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Table 7 Age and season wise prevalence and intensity of ancylostomiasis in the study area, Philhousepet

Age group	No. of subjects	<i>A. duodenale</i> infection %		
		Summer season (%)	Rainy season (%)	Winter season (%)
0–4	20	0	5	0
5–9	48	8.3	10.4	8.3
10–19	60	26.6	28.3	23.3
20–29	28	42.8	50.0	39.2
30–39	48	25	27	20.8
40–49	24	0	4.1	0
50–59	20	20	25	20
>60	16	25	31.2	18.7

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