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Full Length Research Paper

Prevalence and intensity of soil-transmitted helminthiasis among school age children in Ethiope East Local Government Area, Delta State, Nigeria

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The prevalence and intensity of soil-transmitted helminth infections and their relationship to anthropometric indices of 1,351 school children from Ethiope East Local Government Area of Delta State, Nigeria were evaluated. 739 (54.70%) of the subjects were infected by soil- transmitted helminths (STH). The overall prevalences by species were *Ascaris lumbricoides* (48.41%), hookworms (29.76%), and *Trichuris trichiura* (17.39%). 174 (12.88%) were infected with two or more STHs. Males (60.81%) were generally more infected than females (43.30%), but this was only statistically significant among children aged 5 – 7 years. The mean number of eggs per gram of faeces (epg) was generally low. Analysis of epg for each species indicated that 7.8, 7.60 and 1.70% of the subjects had high intensity of infections for *Ascaris,* hookworms and *Trichuris*, respectively. There was no relationship between intensity of infections and wasting, while children with high intensity of infections were more stunted than others.

Key words: Soil-transmitted helminths ,school-age, children, nigeria,prevalence.

INTRODUCTION

Soil-transmitted helminthiasis remain an important cause of morbidityand someti mes mortality in developing tropical countries, particularly among paediatric age group (WHO, 1987). It is estimated that more than one billion people in the world are infected by soil-transmitted helminhs (STH), mainly *Ascaris lumbricoides,* hookworms and *Trichuris trichiura* (Crompton, 1999). Although STHs affect all age-groups, the problem is predominant among the worlds estimated 400 million school children, and is often associated with poor growth, reduced physical activity, impaired cognitive function and learning ability (Stephenson et al 1998; Nokes et al., 1992; Adams et al., 1994; Koroma et al., 1994; Stoltztus et al., 1996).

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Effective control of STH infections depends on improvement in sanitation and living conditions, but implementation is usually hampered by lack of resources and political will. In the short term, school based de-worming has been recommended as a highly cost-effective public health measure in less developed countries (World Bank, 1993). The World Health Organization (WHO) also recommends a baseline survey in school children to determine the prevalence and intensity of infections (Montresor et al., 1998),), and develop effective treatment strategies and case management options (Andrade et al., 2001). In addition, baseline surveys provide basis for development of control programmes at national, regional and district levels.

In Nigeria various school based baseline surveys have been carried out to estimate the current status of STH infections (Ogbe et al., 2002; Adeyeba and Akinlabi, 2002; Etim et al., 2002; Nock et al., 2003; Ukpaiand Ugwu, 2003). This study was undertaken to add to the store of essential baseline data on the

Table 1. Total prevalence of soil-transmitted helminth infections by age and sex.

Age (years)	Male No. Examined	Male No. Infected	Male % Prevalence	Female No. Examined	Female No. Infected	Female % Prevalence	Overall No. Examined	Overall No. Infected	Overall % Prevalence
5 – 7	246	127	51.63	236	85	36.02	482	212	43.98
8 – 11	231	160	69.26	204	113	55.39	435	273	62.76
12–15	263	163	61.98	171	91	53.22	434	254	58.53
Total	**740**	**450**	**60.81**	**611**	**289**	**47.30**	**1,351**	**739**	**54.70**

prevalence and intensity of STH infections in Nigeria. The relationship between intensity of infections and the anthropometric indices of subjects in the study area is also examined.

MATERIALS AND METHODS

The study area

Ethiope East Local Government Area of Delta State, Nigeria is made up of semi-urban settlements of about 100,000 inhabitants, located between latitude 5°N - 6°S and longitude 5.5°E - 6.5°W. The area is characterized by tropical climate with rainy season lasting from March to November. The vegetation ranges from mangrove thick forest to mixed rain forest and grasslands. The inhabitants of the area are mainly indigenous farmers and significant proportion of University students and public servants who reside among the majority indigenous population. Due to rainfall for much of the year (8-9 months) and human activity the soil is porous and moist with temperature range of 28-32°C which favour the survival of STH ova.

Subjects

The subjects were 1351 primary and secondary school children aged 5- 15 years, randomly selected with the lottery method (Bens et al., 1991) from three schools from each of the six main towns in Ethiope East Local Government Area, between February and November 2004. The towns and the number of subjects surveyed were Abraka (301), Eku (255), Ovu (198), Okpara (256), Isiokolo (194) and Kokori (147). Verbal consent was obtained from headmasters of the schools before stool containers were distributed to subjects.

Stool samples were collected in the morning and examined in the afternoon by Kato-katz method to quantitate the number of eggs per gramme of faeces (WHO, 1994). The examination of the stool samples was carried out at the Parasitology Laboratory of Baptist Medical Central Eku, Delta State. To ensure consistency of the readings, second readings were performed in 20% of the slides randomly selected (Andrasw et al., 2001). Intensity of infections for each worm was classified according to the thresholds proposed by the WHO Expert Committee (WHO, 1987).

The following data were collected for each student: weight, height, intensity of infections for *A. lumbricoides,* hookworms and *T. trichiura.* Height and weight measurements were compared to a standard population of the same age by use of Tanner's growth and weight charts (Tanner and Whitehouse, 1976). Children below the third percentile for weight and height were classified as malnourished (Andrade et al., 2001).

RESULTS

Of the total of 1351 stool samples examined, 739 (54.70%) were infected by soil-transmitted helminths (Table 1). Males (60.81%) were generally more infected than females (47.30%), but his was only statistically significant among children aged 5 – 7 years, with prevalence rates of 51.63% and 36.02% among males and females, respectively ($P < 0.05$). In the three age categories STH infections were highest in 8 – 11 years group in both males and females (Table 1).

The general prevalences of STH infections by species are given in Table 2. *A lumbricoides* had the highest overall infection rate of 48.41%. Prevalence of *A lumbricoides* was also the highest in each of the schools sampled. Overall prevalences of other STHs were hookworm 29.76% and *T trichiura* 17.39%. In addition 174 (12.88%) of he subjects were infected by two or more soil-transmitted helminths. Of these 170 had double infections and 4 had triple infections. Schools in Kokori recorded the highest rates of infection with *A lumbricoides* and hookworms (57.14 and 54.64%, respectively), while infection rates were highest among children from schools located in Eku and Abraka (17.25 and 14.29%, respectively).

The mean number of eggs per gramme of faeces (epg) indicated that the intensity of infections was generally low for the three helminhs, following the thresholds proposed by WHO (Table 3). However analysis of epg by species showed that 7.8, 7.60 and 1.70% of the infected subjects had high intensity of infections for *A lumbricoides,* hookworms and *T. trichiura*, respectively.

Table 4 shows the relationship between the intensity of infections and degree of malnutrition. Anthropometric measurements indicated that of the 1351 children examined, 241 (17.84%) were below the third percentile of weight (wasted) and 382 (28.28%) were below the third percentile of height (stunted). The data further reveal that there is no relationship between intensity of infection and wasting since among the uninfected group more underweight subjects (21.03%) were recorded than moderately infected subjects (12.5%). However children with high intensity of infections were more stunted than the other

Table 2. General prevalence of soil-transmitted helminthes by species among school-age children in the study area.

School	n*	*A. lumbricoides*		Hookworm		*T. trichiura*		Mixed infection	
		No. Infected	% Prevalence	No. infected	% Prevalence	No. infected	% Prevalence	No. Infected	% Prevalence
Abraka	301	131	43.51	75	24.92	40	13.29	43	14.29
Eku	2.55	120	47.06	81	31.76	48	18.82	44	17.25
Ovu	198	98	49.49	60	30.30	36	18.18	28	14.14
Okpara	256	111	44.92	72	28.13	51	19.92	34	13.28
Isiokolo	194	106	54.64	80	41.24	31	15.98	13	6.70
Kokori	147	84	57.14	34	23.13	29	19.73	12	8.16
Total	1,351	654	48.41	402	29.76	235	17.39	174	12.88

* Number of school children examined in each town.

Table 3. Prevalence and intensity of infections.

Worm	Overall Prevalence	Mean epg (±SE)	High Intensity
A. lumbricoides	48.41	3,244 ± 261	$^{51}/_{654}$ (7.8%)
Hookworm	29.76	1,074 ± 125	$^{21}/_{274}$ (7.60%)
T. trichinura	17.39	608 ± 102	$^{4}/_{235}$ (1.70%)

children.

DISCUSSION

Data obtained from this study are consistent with a direct effect of lack of sanitation on prevalence and intensity of intestinal helminth infections. The outcome of this investigation has added to the store of knowledge on the occurrence of STHs in Nigeria. The overall prevalence recorded (54.7%) is in conformity with others studies from the Niger Delta part of Nigeria (Obiamiwe, 1977; Nwosu, 1981; Obiamiwe and Nmorsi, 1991; Udonsi, 1984; Ukpai and Ugwu, 2003). These studies have attributed the relatively high prevalence of STHs in children to poor environment and personal hygiene, shortage of potable water and indiscriminate defecation.

The majority of the infections found in our survey were caused by *A lumbricoides,* followed by hookworms and *T. trichiura*. On the basis of the prevalence rates recorded in this study, the study area may be classified as high risk for STHs, hence targeted treatment of children with antihelminthic drugs should be regular. Earlier studies in Agbon (Ogbe et al., 2002), part of the study area, and many parts of Nigeria, have demonstrated the efficacy, acceptability and cost-effectiveness of school based control of soil-helminth infections (Nworgu et al., 1998).

Data on prevalence and intensiy of infections (Table 3) show that with relatively high overall prevalence of *A lumbricoides* (about 50%), the mean number of eggs per gramme of faeces (epg) was low and majority of subjects were lightly infected. Only 7.8% of the 48.41% subjects infected with *A lumbricoides* had high intensity of infection. This is consistent with the findings of Anderson and May (1991) who established that intestinal parasites are neither evenly nor randomly distributed among hosts, but tend to be aggregated in a few heavily infected individuals. Although such people are in the minority, in communities where the prevalence of infection is high, significant numbers are likely to be heavily infected and may experience morbidity.

WHO guidelines recommended periodic treatment rounds for groups with high intensity infections of 10% and above, regardless of the prevalence of overall infections. Since only 7.8% was recorded in this study, a different approach of treatment of only infected persons in school-based control programmes may be more cost-effective, given the semi-urban nature of the study area with relatively high population.

While about 30% of the children were found below the third percentile of height only 17.84% were below the third percentile of weight (Table 4). This could be explained by the fact that underweight represents a state of acute malnutrition that can be corrected by food, while stunting is an index of chronic malnutrition. Lack of adequate nutrients caused by high intensity infection in a critical period can prevent the normal growth spurt in pre-pubertal and

Table 4. Relationship between intensity of infections and degree of malnutrition.

Parameter	Intensity of soil-transmitted helminthiasis			Uninfected Group	Overall
	High (81)*	Moderate (731)	Low (132)	(409)	(1,351)
< 3rd centile of weight	28(34.58%)	92(12.59%)	35(26.52%)	86(21.03%)	241(17.84%)
< 3rd centitle of height	36(45.57%)	201(27.50%)	43(32.58%)	102(24.94%)	382(28.28%)

*Number of subjects in each category.

pubertal children (Andrade et al., 2001). The children sampled in this survey live in environments where they are exposed from birth to intestinal parasites. Thus nutritional status of the children reflect no only previous episodes of acute and chronic infections, but also the adequacy or inadequacy of the diet to support satisfactory rates of growth (Hall, 1993). Each child may have a different history of infections and diet. Therefore cross-sectional studies as carried out in this study may not fully address the impact of intestinal worms on growth. Prospective studies of growth after treatment are recommended to fully elucidate the effect of intestinal worms on growth.

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