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Pevalence of multiple intestinal helminths among children in a rural community

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Summary

Impairment of physical and mental development has been identified as deleterious effects of helminthic infection. As a result, there have been concerted efforts to control this group of diseases especially among children who are most vulnerable. However, knowing the prevalence of multiple infections will strengthen or otherwise justify the use of broad spectrum antihelminthics in the prophylaxis and treatment of intestinal helminthes among children. This study was carried out in a farming community with no tarred access road, electricity or pipe-borne water. The diagnosis of intestinal helminthes was by Kato-Katz thick smear examination technique. One hundred and seventy stool samples from 88 male and 82 female children were examined. The mean age of the children was 8 ± 1.6years. One hundred and sixteen of 170 (68.2%) of the study volunteers had one intestinal helminthic infection or the other. Co-infection by more than one helminth was not uncommon and this occurred in 49.1% of the infected population while 35.4%, 11.2% and 2.6% had double, triple and quadruple infections respectively. *Ascaris lumbricoides* and hookworm were the most common combinations observed in the study 52.6%, followed by the combination of *A. lumbricoides* and *T. trichiura 17.5%*. The triad of *A. lumbricoides*, hookworm and *T. trichiura* accounted for 12.3% among the multiply infected population. However, quadruple infection with *A. lumbricoides*, hookworm, *T. trichiura* and *E. vermicularis* had 2.6% prevalence rate among the study population. *Ascaris lumbricoides* is the most prevalent among all the children, with a prevalence of 81.6%, 63.3% and 52.4% among children aged 12 – 17years, 6-11 years and 0-5years respectively. In conclusion, the presence of multiple infections especially of *Ascaris lumbricoides* and hookworm in almost 26% of the study population and multiple infections in 49.1% of the infected population justified the use of broadspectrum antihelminthics in the management of helminthiasis among school children of the rural community. Thus treatment and mass chemotherapy directed at school children will be a step in the right direction

Keywords: *Multiple, helminthes, children.*

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Résumé

L'affaiblissement du développement physique et mental a été identifie comme étant des effets nuisibles d'infection de l'helminthique. En conséquence, il y a eu des efforts concertes de contrôler ce groupe de maladies parmi les enfants qui sont surtout très vulnérables. Cependant, savoir la prédominance de multiples infections renforcera ou justifiera l'utilisation d'une grande gamme d'antihelminthique dans la prophylaxie et le traitement d'helminthes intestinaux chez les enfants. Cette étude a été entreprise au sein d'une communauté rurale dont l'accès par la route n'est pas goudronnée. Cette communauté n'a ni électricité ni eau portable. Le diagnostique d'helminthes intestinaux a été fait par la technique Kato=katz de l'examen de la tache épaisse. 170 échantillons de selles de 88, enfants males et 82 femelles ont été examines. L'age moyen des enfants était 8 ± Ans 1,6 de 170 (68,2%) des volontaires qui ont été examines pendant l'étude avaient une infection de l'heminthique intestinal ou une autre infection. La co-infection par plus d'un helminthe n'était pas rare et cela s'est produit dans 49,1% de la population infectée alors que 35,4%, 11,2% et 2,6% avaient le double, le triple, le quadruple des infection respectivement. Le Lumbricoides Ascaris et l'ankylostone étaient des combinaisons les plus communes qui ont été observées dans l'étude ce qui représente 52,6% suivies par la combinaison de lumbricoides et trichura T qui représente 17,5%. La triade de lumbricoides A, d'ankylostome et le trichura T représentent 12,3% parmi la population infectée multipliée. Cependant, la quadruple infection avec lumbricoides A, d'ankylostome et le trichura T et vermicularis E avait un taux de predominance de 2,6% parmi la population qui a fait l'objet de l'étude. Le lumbricoide Ascaris est le plus prédominant chez tous les enfants avec une prédominance de 81,6%, 63,3% et 52,4% parmi les enfants dont l'age varie entre 12 -17ans, 6 - 11 ans et 0- 5 ans respectivement. En conclusion, la présence d'infections multiples surtout de lumbrioide Ascaris et d'ankylostome dans presque 26% de la population qui fait l'objet de l'étude et des infections multiples dans 49,1% de la population infectée ont justifie l'utilisation d'une grade gamme d'antihelminthique dans la gestion de l'helminthiase parmi les écoliers dans les communautés rurales. Ainsi, le traitement et la chimiothérapie en masse dont les écoliers feront l'objet seront un pas dans la bonne direction.

Introduction

Intestinal nematode infections are most often seen as common chronic infections of children that lead to relatively mild sickness associated with much physical and mental developmental impairment, including anemia, wasting, stunting and lowered educational achievement [1]. Infection by intestinal parasites has classically been consid-

ered a typical health problem of rural communities. However, there is a high prevalence of intestinal parasitic infections in urbanized settings in developing countries. This has been attributed to the fact that sanitary conditions of low-income population may be worse in overcrowded cities than in most rural communities [2]. Chronic parasitism in a population will not only jeopardize their health, weaken them and render them susceptible to other diseases; it will also make them less effective thereby reducing their productivity and academic performance [3].

Monitoring the prevalence of parasitism in communities and especially among the most susceptible population group is essential as a prelude to effective management and control of these infections. However, knowing the prevalence of multiple infections will strengthen or otherwise justify the use of broad spectrum antihelminthics in the prophylaxis and treatment of intestinal helminthes among children. This study sets out to determine the prevalence of multiple infections by helminthes so as to justify or otherwise the use of single or broad spectrum antihelminthics.

Material and methods

The study area

The study was carried out in a village in the southwestern part of Nigeria between March and June 2002. The villagers are primarily farmers. The community has only a mud-built primary school and lacks other basic amenities such as electricity, piped-borne water while sewage and refuse disposal is open-field system.

The joint University of Ibadan/University College Hospital Ethic Review Board provided ethical approval. This report is part of a larger study evaluating the comparative efficacy and safety of Oxibendazole and Mebendazole in the management of intestinal helminthiasis. Community consent was obtained after the objective of the study was discussed with the village head and villagers at a village meeting. Prior to enrolment into the study, a written or witnessed verbal informed consent of the parent or guardian of each study participant was sought and obtained. Children between the ages of 10 months-17 years who satisfied the enrollment criteria were enrolled into the study.

Early morning stool or freshly passed stool samples were collected in plastic containers on the day of enrollment. After stool collection, the children's age, sex, weight, height, and mid-upper arm circumference (MUAC), in children six years and below, were recorded. A thorough physical examination of all enrolled children was carried out to evaluate their state of health and level of cleanliness.

Stool specimen analysis

The diagnosis of intestinal helminthes was by Kato-Katz thick smear examination technique which is a quantitative method of assessing the number of helminthes' ova in a given amount of stool and is considered the method of choice for the quantitative diagnosis of intestinal helminthes [4]. All faecal specimens were examined macroscopically for blood or mucus staining and the form described as formed, loose, or watery. A wet preparation using normal saline was then examined for motile protozoa, cyst, ova or larva of helminthes. The quantitative egg count was done on Kato-Katz thick smear film. No attempt was made to speciate the hookworm into *Ancylostoma duodenale or Necator americanus* because this involves tedious and time-consuming coprocultural procedures [5]. The Stoll quantitative dilution technique was employed for samples with numerous ova, to maintain a rigorous approach and reduce reading time. In cases where *Strongyloides stercoralis* were found, Bearmann's semi-quantitative test was performed [5]. Statistical method employed was by simple percentages within the different age groups and among the infected and total study population.

Result

One hundred and seventy stool samples from 88 male and 82 female children were examined. The mean age of the children was 8 ± 1.6years. The frequency distribution of age ranges and intestinal helminthes is described in Table 1. Among the study population 116 (68.2%) were infected with at least one intestinal helminth parasite while almost half, 57 (49.1%) of the infected children had two or more types of infection, 50.9% had one type of helminth. Table 2 shows the proportion of population with single or multiple helminthes infection.

Table 1: Percentage intestinal helminthes infection by age.

Helminth	0–5 yrs n=42(%)	6–11 yrs n=90 (%)	12–17 yrs n= 38 (%)	Total n=170(%)
A. lumbricoides	22 (52.4)	57 (63.3)	31 (81.6)	110 (64.7)
Hookworm	5 (11.9)	24 (26.7)	18 (47.4)	47 (27.6)
T. trichiura	3 (7.1)	15 (16.7)	8 (21.0)	26 (15.3)
E. vermicularis	1 (2.4)	5 (5.5	0	6 (3.5)
S. stercoralis	0 (0.0)	2 (2.2)	2 (5.3)	4 (2.4)

Ascaris lumbricoides was the most prevalent helminthic infection; detected in 110 of 170 (64.7%) of the study population. Other helminthic infections detected among the study population are hookworm (27.6%), *Trichuris trichiura* (15.3%), *Enterobius vermicularis* (3.5%) and *Strongyloides stercoralis* (2.4%). Among the infected population 94.8% had *Ascaris lumbricoides*, 40.5% had hookworm and 22.4% had *Trichuris trichiura*, while 5.2% and 3.4% had *Enterobius vermicularis* and *Strongyloides stercoralis* respectively (Table 3).

Table 2: Proportion of population with single/multiple helminthes infection.

No of helminth Infection	Total sample Population (%) n = 170	Infected population (%) n=116
1	59 (34.7)	59 (50.9)
2	41 (24.1)	41 (35.3)
3	13 (7.6)	13 (11.2)
4	3 (1.8)	3 (2.6)
Total	116 (68.2)	116 (100.0)

Table3: Prevalence of intestinal helminthes infection in children.

Parasites	Total Population % n = (170)%	Infected population n = (116)
A. lumbricoides	64.7 (110)	94.8 (110)
Hookworm	27.6 (47)	40.5 (47)
T. trichiura	15.3 (26)	22.4 (26)
E. vermicularis	3.5 (6)	5.2 (6)
S. stercoralis	2.4 (4)	3.4 (4)

lumbricoides and *T. trichiura* (17.5%). The triad of *A. lumbricoides*, hookworm and *T. trichiura* accounted for 12.3 % while quadruple infection with *A. lumbricoides*, hookworm, *T. trichiura* and *E. vermicularis* was 5.2%.

Discussion

Impairment of physical and mental development has been identified as deleterious effects of helminthic infection. As a result, there have been concerted efforts to control this group of diseases especially among children who are most vulnerable. The findings of this study have confirmed a persistent high prevalence of intestinal helminthic infection among rural communities in southwestern Nigeria [3,6-8].

This study was carried out in a farming community with no tarred access road, electricity or pipe-borne water. One hundred and sixteen of 170 (68.2%) of the study volunteers had one intestinal helminthic infection or the other. As was observed in previous studies [2,6-8] *Ascaris lumbricoides* was the most prevalent helminthic infection among the study population being present in 64.7% of study volunteers. It is interesting to note that *A. lumbricoides* is the most prevalent among the school children of all age groups (Table 1). With 12 – 17 years and 6-11 years having 81.6% and 63.3% prevalence respectively,

Table 4: Distribution of specific multiple intestinal helminthes infection by age group.

Helminth types	0-5yrs (n=6)	6-11yrs (n= 31)	12-17yrs (n= 20)	Total= 57
Ascaris, Hookworm,	3 (50%)	16 (57.6%)	11 (55%)	30 (52.6%)
Ascaris, Trichuris	2 (33.3%)	5 (16.1%)	3 (15%)	10 (17.5%)
Ascaris, Trichuris Hookworm	0	3 (9.7%)	4 (20%)	7 (12.3%)
Ascaris, Hookworm, Trichuris E. vermicularis	0	3 (9.7%)	0	3 (5.2%)
Ascaris, Hookworm E. vermicularis	1 (16.7%)	1 (3.2%)	0	2 (3.5%)
Ascaris, Hookworm Strongyloides	0	0	2 (10%)	2 (3.5%)
Hookworm, Trichuris	0	1 (3.2%)	0	1 (1.8%)
Ascaris, Trichuris E. vermicularis	0	1 (3.2%)	0	1 (1.8%).
Ascaris, Strongyloides Trichuris	0	1 (3.2%)	0	1 (1.8%)
Total Multiple	6 (10.5%)	31 (54.4%)	20 (35.1%)	57 (100%)

Co-infection by more than one helminth was not uncommon and this occurred in (57) 49.1% of the infected population while 35.3%, 11.2% and 2.6% had double, triple and quadruple infections respectively (Table 2). Table 4 gives a detailed description of specific helminthic co-infection among the various age groups. Among the population with multiple infections, *Ascaris lumbricoides* and hookworm were the most common combinations observed in the study (52.6%), followed by the combination of *A.*

while the lowest prevalence rate was seen in pre-school age group and toddlers (52.4%). Similarly, hookworm and *T. trichiura* were most prevalence among the same age group 12-17 years with 47.4% and 21.0% and 6-11 years with 26.7% and 16.7% respectively compared to the prevalence rate of 11.9% and 7.1% respectively for preschooler and toddlers (0-5 years).

Ascaris lumbricoides, Hookworm, *Trichuris trichiura, Enterobius vermicularis*, and *Strongyloides*

stercoralis were present in 64.7%, 27.6%, 15.3%, 3.5% and 2.4% of the study volunteers respectively, with A. *lumbricoides* being present in 94.8% of the infected population. This is comparative to the prevalence rate of 95.4% recorded by Mafiana [7] in Ilewo-orile village in Ogun state, but higher than the 1989 prevalence rate of 71.1% and the 85% recorded by Ogbe and Odudu [8], and Onadeko and Ladipo [6] all in Nigeria. The prevalence rate recorded in this study is higher than the 63% prevalence recorded by Oslen [10] who studied a rural community of Western Kenya. The distribution of *Enterobius vermicularis* infection was again higher in 6-11 years old (5.5%) followed by 0-5 years (2.4%) while *S. stercoralis* was not found in 0-5 years but have a prevalence of 2.2% in 6-11 years and 5.3% in 12-17 years old children. This is in complete agreement with the finding by Dada-Adegbola and Bakare [11] in which none of the normal nourished children 0-5years has *Strongyloides stercoralis*. It was also observed that none of the under five in this community have any physical findings suggestive of malnutrition.

We also observed the ubiquitous triad comprising of *Ascaris, Hookworm* and *Trichuris* as seen in previous studies in other rural communities in Southwestern Nigeria [6,8,9]

The prevalence of *Enterobius vermicularis* (3.5%) and *Strongyloides stercoralis* (2.4%) in this study is higher than what was observed in other surveys carried out in peri-urban area of Ibadan [3,6]. The high prevalence of Hookworm among the children is not surprising as there are no facilities for proper disposal of feaces in the community, defecation takes place indiscriminately in open fields, and around the houses in addition, children walk barefoot in the village to school and to surrounding farms and hamlets and thus increasing their risk of infection.

The children in age-group 12 – 17 years have the highest prevalence rate of intestinal helminthes in general and for each of the intestinal parasite except for *Enterobius vermicularis* followed by the age-group 6 – 11 years while the lowest prevalence was observed in the preschool age group (i.e 0 –5 years). The distribution thus observed among the various age groups in the rural community in this study is a reflection of the activities and habits of the inhabitant. The children were observed to be least careful about personal hygiene and health promotion habits hence they form high-risk group as most were observed to go about their daily activities barefoot in the school, in the bush/farm and around the houses. It is not surprising therefore that the highest prevalence of *Enterobius vermicularis* was recorded in the age group 6-11years as their hand washing practice before eating was observed to be almost nil. The lower prevalence of *E. vermicularis* in the 12 – 17 years is probably multifactorial and may be due to the change in attitude, habit and more awareness towards personal hygiene and knowledge of health education although judging from the records for other helminthes the reason is not fully elucidated by this study.

The distribution of specific multiple intestinal helminthes infection by age group is described in detail on table 4. *Ascaris lumbricoides* and Hookworm accounted for 52.6% of the multiple infections in this study followed by *Ascaris lumbricoides* and *Trichuris trichiura* with 17.5% of this population. Meanwhile triple infection with *Ascaris lumbricoides*, Hookworm and *Trichuris trichiura* was seen in 12.3% while concomitant infection with *A. lumbricoides*, Hookworm, *E. vermicularis* was 3.5% and *A. lumbricoides*, Hookworm, *S. stercoralis* was also 3.5%. The presence of four helminthes in an individual was seen in 3 (5.2%) cases, this constitute 1.8% and 2.6% of the total study and infected children population respectively (Tables 2 and 4).

In conclusion, the presence of multiple infections especially of *Ascaris lumbricoides* and hookworm in almost 26% (44 of 170) of the study population and multiple infections in 49.1% of the infected population justified the use of broadspectrum antihelminthics in the management of helminthiasis among school children of the rural community. Thus treatment and mass chemotherapy directed at school children will be a step in the right direction; however the use of broadspectrum antihelmintics will be most appropriate whether as prophylaxis or in active treatment for control and prevention.

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