

WORM INFESTATION AND ANAEMIA AMONG PRE-SCHOOL CHILDREN OF PEASANT FARMERS IN CALABAR, NIGERIA.

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ABSTRACT

Background: Worm infection and anaemia are common childhood conditions in Nigeria. We assessed the status of helminthiasis and associated anaemia among pre school children of peasant farmers aged 1-5 years living in a rubber plantation near Calabar, Nigeria.

Design: Cross sectional.

Method: Three hundred and fifty children were selected by multi-stage cluster sampling technique. Freshly passed stool was examined using Kato-Katz method while anaemia was estimated using haematocrit technique.

Result: Of the 350 children, 174 (49.7%) had intestinal helminths: *Ascaris lumbricoides* 64.4%, hookworms 10.9% and *Trichuris trichuria* 1.1%. There were 41 (23.6%) children with polyparasitism, 33 of them were due to *Ascaris lumbricoides* and hookworms. The worm load was generally light in intensity with egg per gram of stool ranging from 24-60,960. Males (28.9%) were infected more than females (20.8%). The frequency of infection increases with age. The prevalence of anaemia among the entire study population and in those infected with worms was 56.6% and 56.9% respectively. With polyparasitism there was a relative increase in the frequency of anaemia females > males.

Conclusion: Worm infections and anaemia are common in our children. A comprehensive control strategy involving good sanitation, sinking of bore hole for clean water supply and regular deworming exercises are recommended.

Key Words: Worm, Anaemia, Farmers

(Accepted 5 July 2007)

INTRODUCTION

Worm infection is indeed one of the most common but neglected disease¹, affecting more than 30 percent of the world's people.¹ The global burden of disease caused by the 3 major intestinal nematodes is estimated at 22.1 million disability-adjusted life years lost for hookworms, 10.5 million for *Ascaris lumbricoides*, 6.4 million for *Trichuris trichuria*, and 39.0 million for the three infections combined.² Worms affect the nutrition of their host by either ingesting blood leading to loss of iron or by depleting nutrients. Synergism exists between intestinal inflammation caused by worms and growth failure. New studies show that hookworm inhibits growth and promotes anaemia in preschool as well as school age children.^{1,2} Many die from intestinal obstruction and complications caused by large adult worms and millions more are malnourished, stunted and severely anaemic.

Worm infestation is a major problem in children from resources limited countries due to impure water, low socio- economic status; poor sanitation and low literacy level of parents particularly

mothers.³ Causes of anaemia are often multifactorial and are related in a complex way.⁴ First, the relative importance of each factor, for example, hookworm or malaria varies in different settings. More than 100 millions African children are thought to be anaemic and prevalence in settings where malaria is endemic ranges between 49% and 76%.⁵ Pre- school children in Africa have some of the highest rates of anaemia in the world.⁶ The presence of anaemia in children under 5 years of age is of particular relevance because it negatively impacts on mental development and future social performance.⁷ The interplay of worms and anaemia exists, however, only few studies have been carried out to establish the relationship between anaemia and worm infection.^{8,9}

The present study was therefore carried out to determine the prevalence of geo-helminths and anaemia as well as the relationships between them in pre-school children of rubber plantation workers.

MATERIALS AND METHODS

This cross sectional study was conducted from November 2004 through January 2005 among children (aged 1-5 years) of labourers of a rubber plantation near Calabar, in Cross River State, Nigeria. The houses of these workers are disposed in camps and each family unit lives in a one-room apartment;

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each of the camps shares one communal toilet system. Indiscriminate disposal of human waste is commonly practiced in this community. Their main source of water is a nearby stream.

The management of the rubber plantation and ethical committee of the University of Calabar Teaching Hospital (U.C.T.H), Calabar, approved the study. Consent was obtained from the parents/guardians.

A multistage system of sampling was used: made of a simple random sampling which selects 50% of the clusters. Among the selected clusters, 50 subjects were selected from each cluster using a 1 in 3 systematic sampling method after an initial random sampling to select the 3rd child aged 12-60 months.

For clusters that had less than fifty preschool children, every child was selected. To make up for the deficits in clusters with less than fifty subjects, additional subjects were selected from the larger camps.

All children that were dewormed within one month prior to the study were excluded. Each parent/guardian provided freshly passed stool by the child into a container that was supplied by the investigators. The samples were transferred immediately to our departmental laboratory and examined by the departmental laboratory scientist to determine the number of eggs per gram (epg) of stool on the same day using Kato-Katz method (cellophane thick smear faecal examination technique).¹⁰

The grading of intensity as light, moderate and heavy infection was based on the WHO grading system.¹¹ A count greater than 50000, 10000 and 10000 epg was graded as heavy infections for *A.lumbricoides*, hookworms and *T.trichuria* respectively, and less than 5000, 10000 and 1001 as light infections for the 3 worms respectively. Egg count of 5,000-50,000 and 1001-10,000 per gram of stool was regarded as moderate infections for *A.lumbricoides* and *T.trichuris*. The egg count for moderate infection regarding hookworm is yet to be determined.¹¹

Blood for estimation of haematocrit (Hct) was obtained through a finger prick into two heparinized capillary tubes. Haematocrit was measured from the volume of erythrocytes as a percentage of the total sample volume after centrifugation of the heparinized capillary blood from a finger prick at 1200 rpm (Hawskey, England) immediately after collection.^{12,13} Examination was done by the haematologist at the survey site. Anaemia was diagnosed if the haematocrit was $\leq 33\%$.¹⁴

All the children that were recruited into the study were later dewormed with Levamisole and those that were ill were treated by us. Those with severe pathologies were referred to our hospital.

The data were analyzed using Epi info software

RESULTS

During the period, a total of 350 pre-school children aged 1-5 years were recruited into the study. Of this number, 191 were males and 159 were females with a male to female ratio of 1.2:1. The mean age was 35.59 ± 3.67 months and the median age was 36 months (Table 1).

Worm Infestation

One hundred and seventy-four children (49.7%) had intestinal worm infestation with male to female prevalence rates of 52.9% and 45.9% respectively. This however, was not statistically significant ($\chi^2 = 1.42, P=0.233$).

The infection frequency was lowest (33.8%) in the 12-23 months age group and highest (61%) in the 48-60 months age brackets (Table 11).

Only 3 types of worms were isolated amongst the studied population. These were *Ascaris lumbricoides* 112 (64.4%), hookworms 19, (10.9%) and *Trichuris trichuria* 2 (1.1%). Polyparasitism was identified in 41 (23.6%) of the cases consisting of *Ascaris lumbricoides* with hookworm 33, *Ascaris lumbricoides* with *Trichuris trichuria* 5, hookworm with *Trichuris trichuria* only 1. Two of the children were infested with all the 3 worms.

The egg loads range was between 24 and 60,960 epg of stool. Only one child with *Ascaris* excreted more than 50,000 epg. Twenty-two of those with roundworms were of moderate intensity, 8 of them having polyparasitism. All the children with hookworms and *T. trichuria* had infection of light intensity.

Anaemia

A total of 198(56.6%) of the children were anaemic (Table III). The lowest (15%) and the highest (46%) haematocrit were recorded in two males aged 26 and 17 months respectively. Twenty-five (12.6%) of the anaemic children had haematocrit $\leq 25\%$. The prevalence of anaemia increased with age ranging from 51.9% among those aged 12-23 months to 60.8% among those aged 36-47 months with a decline to 55.5% among those aged 48-60 months.

Ninety-nine (56.9%) of the worm infested children were anaemic which is made up of 52 (51.2%) males and 47 (64.4%) females. The difference was, however, not statistically significant ($X^2 = 2.37, P = 0.123$). The proportion of children with anaemia and worm infestation 61(54.5%) for *ascariasis*, 13(68.4%) for hookworm, 18 (54.5%) for *ascariasis* and hookworm, 4(80.0%) for *ascariasis* and *Trichuris trichuria*, 1(100.0%) for hookworm and *Trichuris trichuria* and 2(100%) for all types were anaemic.

Table 1: Age and Sex Distribution of Studied Children

Age (months)	Male (%)	Female (%)	Total (%)	X ²	P-value
12-23	41 (11.7)	36 (10.3)	77 (22.0)	0.02	0.89
24-35	43 (12.3)	33(9.4)	76 (21.7)	0.07	0.79
36-47	46 (13.2)	33 (9.4)	79(22.6)	0.38	0.54
48-60	61 (17.4)	57 (16.3)	118(33.7)	0.43	0.51
TOTAL	191 (54.6)	159 (45.4)	350(100)	5.49	0.019

TABLE II: Prevalence of Helminthiasis by Age Group and Sex

Age group (month)	No infected (%)	Male	Female	Polyparasitism (Total No.)	Male	Female
12-23	26 (33.8)	14	12	1	1	0
24-35	37 (48.7)	21	16	7	6	1
36-47	39 (49.4)	28	11	11	8	3
48-60	72 (61.0)	38	34	22	13	9
TOTAL	174 (49.7)	101	73	41	28	13

TABLE III: Frequency of Anaemia among the Population

Ages	No With Anaemia			No Without Anaemia			x ²	P-value
	Male	Female	Total	Male	Female	Total		
12-23	18(8)*	22(6)*	40(14)*	23(6)*	14(6)*	37(12)*	0.63	0.43
24-35	22(10)*	19(9)*	41(19)*	21(11)*	14(7)*	35(18)*	0.15	0.70
36-47	27(15)*	21(8)*	48(23)*	19(13)*	19(3)*	31(16)*	0.52	0.47
48-60	32(19)*	37(24)*	69(43)*	29(19)*	20(10)*	49(29)*	0.19	0.67
TOTAL	99(52)*	99(47)*	198(99)	92(49)*	60(26)*	152(75)*	11.57	0.00067

Parenthesis (*) indicates number with worms

Table IV: Mean Haematocrit (HCT) of Worm Infected and Uninfected Children

Age (months)	Mean Hct of infected children	Mean Hct of uninfected children	t-value	P-value
12 -23	32.75±4.1	33.4±4.5	0.65	0.25
24-35	32.4±4.1	31.8±5.8	1.06	0.147
36-47	31.7±3.9	32.4±4.6	0.67	0.26
48-60	32.5±3.7	34.1±4.5	2.11	0.018

DISCUSSION

The high prevalence (49.7%) of helminthiasis among the children in this community is a reflection of the poor state of environmental hygiene. They still defecate indiscriminately hence the soil, their food and water from the streams could have been very easily contaminated.

That the frequency of helminthiasis tends to increase with the age of the children, especially in males, is similar to findings by other investigators.^{3,15} This could be explained by the adventurous nature of the relatively older ones who play around bare-footed and could easily consume unwholesome and contaminated food items.

Anaemia is one of the most extensive world wide health problem, affecting mostly developing countries.¹⁶ Indeed, pre-school children in Africa have some of the highest rates of anaemia in the world.⁶ The present study reveals a worrisome frequency of anaemia in this population. The result of this survey indicates that the frequency of anaemia among those children infected with worms (56.9%) is not different from general population (56.6%). However, the mean haematocrit among those with worms appear generally lower than those without worms except for those aged 24-35 months (Table IV). The central factor for the anaemia should therefore most probably be related to malnutrition rather than the load of helminthiasis which was observed to be of light intensity. Nevertheless, it is possible that the iron stores could have been more depleted in those with worms compared with the uninfected counterpart. Haematocrit does not provide information on the iron stores of individuals.^{5,12} Iron studies could have been more appropriate but this was not possible due to lack of laboratory facilities. It is therefore plausible to incriminate worms as a strong contributor to the low haematocrit status in this population. Apart from causing blood loss and interference with iron absorption, helminthiasis is associated with anorexia that may decrease intake of all nutrients in children especially if they are on marginal diets.² In the present study polyparasitism carries with it a relatively high frequency of anaemia which is in consonance with other studies.^{2,17} The probability of having anaemia from worm appears highest with combinations that include *Trichuris trichuria*. This is not surprising because, even low intensity polyparasitism has been associated with an increased risk of having anaemia.¹⁷

Anaemia in the under-5 children, especially in association with worm infection, can negatively impact on their mental and social performance.¹ Severe anaemia during this critical period of development is often fatal while moderate

anaemia leads to growth and cognitive impairment.

CONCLUSION

The findings of this survey have demonstrated that intestinal helminthiasis and anaemia are common health problems in our region and should receive more attention than they currently receive. Since regular deworming exercises have been shown to reduce the frequency of anaemia in children,^{1,18} this is recommended for our children at least twice a year. Other recommendations include community enlightenment programmes on environmental sanitation, human waste disposal, and good water supply.

Acknowledgement: We are grateful to the management of the rubber estate for allowing us to carry out this survey and Prof. Asindi A. Asindi for painstakingly reading through the manuscript.

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