Original Article

Relationship Between Nutritional Status and Intensity of Common Intestinal Helminths Among Children in Enugu, South-East Nigeria

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Abstract

Background: Intestinal helminthiasis is associated with malnutrition in children. **Aim:** The objective of this study was to determine the intensity and effect of the common intestinal helminths on the nutritional status of children in Enugu, Nigeria. **Subjects and Methods:** A cross-sectional study of 460 children conducted in Enugu metropolis, south-east Nigeria between August and September 2003. Their stools were analyzed at the research laboratory of the Federal Ministry of Health, National Arbovirus and Vector Research Center, Enugu. The intensity of the common intestinal helminths was determined using the standard Kato-Katz method of fresh stool samples. The classification intensity of helminthic infestation was according to the World Health Organization classification. Data were analyzed using Statistical Software for Social Sciences version 11.0 (Chicago IL, USA). $P < 0.05$ was regarded as statistically significant. **Results:** 452 of 460 children (98.3%) had normal height for age, weight for age and weight for height *Z*-scores. Six of the 460 children (1.3% were wasted), 1/460 stunted (0.2%) and 1/460 wasted and stunted (0.2%). 150 out of 460 (32.6%) studied were infected with helminths. There was no significant relationship between the intensity of helminth infection and the nutritional status of the children. **Conclusion:** Although the prevalence of helminthiasis in children in Enugu was high, intensity of helminthiasis in these children was mainly mild. Hence, majority of them had normal weight and height measurements for age and sex.

Keywords: Anthropometry, Children, Helminthic infection

Introduction

Intestinal helminthiasis is a common cause of morbidity in children.[1] It is estimated that over 1 billion people are infected with *Ascaris lumbricoides,* another 1 billion with hookworm and 1 billion with *Trichuris trichiura* world-wide.[2] The prevalence and the public health burden of intestinal helminths in Nigeria is increasing.[3-6] Children are more infected than adults and the age groups most commonly affected are those between the age of 6-15 years followed by 1-5 years of age.[7] Children infected with helminths are at risk of impaired growth.[8] This is because helminths play an important role in the etiology of childhood malnutrition.[9] In Enugu, previous studies[5,10] documented high prevalence of intestinal helminthiasis in children but none of these studies documented the intensity of the common intestinal helminthes and the possible effect on nutritional status of children. The aim of this study therefore, was to determine the relationship between nutritional status and intensity of common intestinal helminths among children in Enugu, South-east Nigeria.

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Subjects and Methods

This was a cross-sectional study. The study was developed in Enugu urban which is the capital of Enugu State in the

South-eastern part of Nigeria between August and September 2003. Enugu state is located in the tropical rain forest zone and lies about 223 m above sea level. Its climate is humid with a mean daily temperature of approximately 27°C. The season is divided into rainy and dry seasons with an average annual rainfall of about 2000 mm. Ethical clearance for this study was obtained from the Health Research and Ethical Committee of the University of Nigeria Teaching Hospital Enugu. Written informed consent was obtained from the guardians and parents while assent was obtained from the older children before enrollment in the study. The study population consisted of children attending nursery and primary schools in Enugu. Structured and pretested questionnaire were completed by the guardians and parents of children (Questionnaire 1). Information sought included age in years, sex, social class of parents, place of domicile (urban vs. semi-urban and urban slum), anthropometry (height in centimeters and weight in kilograms) and past history of antihelminthics. Children with a history of receiving anti helminthics in the last 3 months were excluded from the study. Three out of 73 and 3 out of 139 government approved nursery and primary schools respectively were randomly selected from the metropolis. A multi-stage sampling technique was used to select 460 pupils who were studied. There was no established policy on deworming for children in the selected population.

Height/length measurement

The lengths of children <2 years were measured by the researchers using an infantometer. Each subject was placed, faced upward with head towards the fixed end and the body parallel to the long axis of the board. One assistant ensured that the crown of the child's head was in contact with the fixed headboard. The researchers held the subjects' feet, without shoes, toes pointing directly upwards and kept the subject's knees straight. The moveable footboard was then brought to rest firmly against the heels. For children over 2 years of age, their heights were measured by the researchers in a standing position, using a stadiometer (England model of 17 Camp den Street, London). The subject stood straight with the feet together, knees straight and heels, buttocks and shoulder blades in contact with the vertical surface of the stadiometer. The moveable headboard was then gently lowered until it touched the crown of the head. The height measurement was taken with the examiner's eye level with the head board to avoid parallax errors. Height and length were measured to the nearest millimeter.

Weight measurement

Children <2 years were weighed with infant spring weighing scale (Vintage Waymaster, England; 1990). They were weighed naked by the researchers. After putting the subject into the scale, the weight was recorded as soon as the indicator on the scale stabilized. The sensitivity of the Waymaster scale is 0.05 kg. The weight was recorded to the nearest 0.1 kg. Children above 2 years were weighed with a standing scale (England Salter scale, model 150).

Anthropometric assessment

The weight for age, height (or length) for age and weight for height *Z*-scores of the subjects were determined using the National Center for Health Statistics/World Health Organization (WHO) International Reference Standards.[11] Underweight, stunting and wasting were defined as *Z*-scores ≤2 SD of weight-for-age length/height-for-age and weight-for-length/height respectively.

Specimen collection

A clean, labeled unbranded specimen container was given to each child for stool specimen to be collected the next morning. Such samples were submitted on arrival at school the next day. Those unable to produce stool were allowed to go back home with their containers and encouraged to submit their stools the subsequent mornings. The stool specimens were immediately taken to the laboratory and kept in the refrigerator for analysis later the same day.

Stool analysis

The stool samples were analyzed in the laboratory of Federal Ministry of Health, National Arborvirus and Vectors Research Division, Enugu using the Kato-Katz method.[12]

Each stool specimen was stirred by the researchers for 5 min to become homogenous. Then the Kato-Katz screen was pressed on the feces by the researchers to separate feces from the debris. Some of the screened fecal specimen was used to fill the hole in the Kato-Kit that was placed centrally on a clean slide.

Pre-soaked cellophane (25 mm) in glycerol-malachite green solution for 24 h was spread on the fecal specimen.[12] The slides were viewed using a × 10 and × 40 objectives with the assistance of a laboratory scientist. The slide was later re-viewed to detect other helminthes. In order to get the number of eggs per gram of stool, the number of eggs was multiplied by 20. The intensity of intestinal helminth was categorized into light, moderate and heavy infection based on number of eggs per gram of stool as recommended by the WHO.[13] The different types of hookworm were not further analyzed due to lack of equipment to differentiate them but the presence of at least one ovum was taken to be positive.

Data analysis

Data analysis was with Statistical Software for Social Sciences version 11.0 (Chicago IL, USA). Chi-square test was used to test for significant relationship between the categorical variables. $P < 0.05$ was regarded as significant.

Results

Out of 500 questionnaires that were administered, 460 subjects were completed the study giving a rate of 92.0%. They were aged 1-10 years and 188 of the 460 children (40.9%) were aged between 8 and 9 years. 228 of the 460 children (49.6%)

were males while 232/460 (50.4%) were females. Out of 460 children studied, 452 (98.3%) children had normal height for age, weight for age and weight for height *Z*-scores. 150 of the 460 children (32.6%) had helminthiasis. The prevalence of helminthiasis in relation to the nutritional status of the children is a shown in Table 1. Whereas 6/460 (1.3%) children were wasted, 1/460 (0.2%) was stunted and 1/460 (0.2%) was both wasted and stunted. 145 of 452 children (32.1%) with normal growth parameters compared to 5 of 8 children (62.5%) with malnutrition were infected with helminths ($P = 0.07$). 65 of the 145 infected children (44.8%) with normal growth status compared to 2/5 (40.0%) with malnutrition were infected with *A. lumbricoides* ($P = 0.54$).

Light, moderate and heavy intensity of helminthic infection were observed in 147/150 (98.0%), 2/150 (1.3%) and 1/150 (0.7%) of the children respectively as shown in Table 2. Light infection predominated in the various specific helminthic infections [Table 2]. There was no significant relationship between intensity of infection and types of helminth ($P = 0.11$). Furthermore there was no significant relationship between the intensity of infection and nutritional status in our subjects.

Discussion

Our study showed that 145 of 452 children (32.1%) with normal growth parameters compared to 5 of 8 children (62.5%) with malnutrition were infected with helminths ($P = 0.07$). Most of our subjects 147/150 (98.0%) had light intensity of helminthic infections. This study suggested that the acquisition of intestinal helminths is not associated with reduction in growth/anthropometric status of the children in Enugu. Mahendra *et al*.[14] in North-Eastern Peninsula of Malaysia also reported no difference in the growth parameters between helminth-infected and non-infected children. Their findings were attributed to the fact that most of their subjects had light helminthic infection. In our own study, majority of our children also had light helminthic infection (98.0%); hence, the likely explanation for the normal anthropometric status in almost all our subjects (98.3%). It is also possible that most of our subjects may had acute helminthic infestation that less likely will affect the weight and height of the children. The relationship between stunted and/or wasted growth with helminthic infection showed a statistical trend that failed to attain significant level ($P = 0.07$) probably due to the small number of wasted and or stunted children in this study. The negative effect of helminthiasis on growth of children has been demonstrated by some authors.[14,15] Again, in our study, children who took anti-helminthics in the recent past (≥3 months prior to the study) were not excluded and this might also explain why majority of these children were not infested with helminths and most of those infested had mild infestation and normal anthropometric status. This study suggests that mild helminthic infestation is more common in children in Enugu compared with moderate and heavy infestations. Most children who were infected with helminthes had normal anthropometric parameters. The impact of helminthiases on nutrition depends on the intensity of the infection. Low intensities of helminth infections are known to cause very little or no clinical impact. The strength of this study is the ability to relate helminthiasis with nutritional status of children although the study is limited by non-inclusion of children from rural communities. We therefore, recommend that further study should be carried out for a longer period and children from rural communities included.

Table 1: Proportion of children infected with various helminths according to nutritional their nutritional status

Status	No. of children infected with helminths (%)		
	Ascaris	Hookworm	*Trichuris*
Normal	65 (44.8)	57 (39.3)	23 (15.9)
Malnourished*	2 (40.0)	2 (40.0)	1 (20.0)
Total	67 (44.7)	59 (39.3)	24 (16.0)

*Wasted or stunted

Table 2: The proportion of children with different degree of helminthic infection

Helminth	Intensity of infection (%)		
	Light	Moderate	Heavy
Ascaris lumbricoides	66 (98.5)	1 (1.5)	0 (0.0)
Hookworm	59 (100.0)	0 (0.0)	0 (0.0)
Trichuris trichiura	22 (92.0)	1 (14.0)	1 (14.0)
Total	147 (98.0)	2 (1.3)	1 (0.7)

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