

## DEMOGRAPHIC AND BIOCHEMICAL FEATURES ASSOCIATED TO CHILDREN INFECTED WITH INTESTINAL HELMINTHS

Airauhi LU<sup>1</sup>, Idogun ES<sup>2</sup>

### ABSTRACT

**Objective:** The objective of the study was to characterize demographic and clinical presentations of children with intestinal helminthiasis and also assess the effects of ascariasis on some plasma biochemical parameters.

**Methodology:** It was a cross-sectional community-based study carried out amongst rural children aged between 0-16 years. One stool sample per child was collected and examined microscopically for parasites. Stool smear positive children were studied and evaluated for clinical signs and symptoms. Blood was obtained from them and total protein, serum albumin, packed cell volume, vitamin C and E were determined in them as well as among children with stool parasite negative which served as controls.

**Results:** A total of 239 children were enrolled and had their stool samples collected, 147(61.5%) of the stool were infected. The most prevalent intestinal helminth was *Ascaris lumbricoides* 105(43.9%), *Trichuris trichuria* 28(11.7%) and Hookworm 14(5.9%). The commonest complain among the children was diarrhea 40(27.2%) and the least vomiting 4(2.7%). The commonest clinical finding was pallor 15(10.2%) and the least wheezing 3(2.0%). Biochemically, the plasma total protein, albumin, Vitamin C and E as well as the PCV were significantly reduced in children with moderate and heavy *Ascaris* infection than controls.

**Conclusions:** Heavy and moderate ascariasis are associated with various morbidities evident by both clinical and biochemical findings. Our findings should re-emphasize the need for all stakeholders to support and implement community-based control programmes of intestinal helminthiasis in Nigeria and other tropical countries.

**KEY WORDS:** Intestinal helminthiasis, Worm burden, Demography, Biochemical, Features.

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1. Airauhi LU, Ph.D  
Department of Medical Microbiology,
  2. Idogun ES, MB. ChB. FMCPath, MPH  
Department of Chemical Pathology,
- 1-2: College of Medicine,  
University of Benin,  
Benin City, Nigeria.

Correspondence:  
Dr. Idogun E.S,  
Department of Chemical Pathology,  
University of Benin Teaching Hospital,  
P.M.B 1111,  
Benin - City,  
Nigeria.  
E-mail: sylvesteridogun@yahoo.co.uk

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### INTRODUCTION

Intestinal parasites represent a relevant clinical problem, especially in developing countries, where they are responsible for morbidity and mortality in adults and children, and many epidemiology data are available in the literatures.<sup>1,2</sup> However, there is dearth of information on intestinal parasitoses in children of rural population at community levels because they are not well investigated and so are not always reported.

The highest rates of protozoan and helminths infections world wide occur in the tropical regions and the distribution of these infections depend on conditions such as suitable climate

and human activities, population movements and poor sanitations.<sup>3</sup> Diarrhea, including that of parasitic origin remains one of the most common illness in children, and one of the major causes of infant and childhood mortality in developing countries.<sup>4</sup> Many epidemiological data on the distribution and prevalence of intestinal parasites as well as the effect of these parasites on host nutrition are well documented in the literatures.<sup>5-7</sup> However the extent of morbidity of intestinal parasites in children of rural dwelling have not been well studied in our environment.

The objective of this study was to fully characterize the demographic and clinical presentations of children with intestinal helminthiasis as influenced by socio economic factors and also assess the effects of ascariasis on some biochemical parameters. It is hoped that the results of this study will help to reawaken the need to support and implement programmes aimed at the control of intestinal parasites in children living in the tropics.

## METHODOLOGY

This epidemiologic cross-sectional study was conducted among children between September 2003 and August 2005 in mostly rural communities of Edo State, Nigeria. Study participants were aged 0 – 16 years, both males and females were enrolled. Five villages were sampled, these were; Igueben, Ugbegun, Ubijaja, Iruokpen and Ebele, all in Edo State of Nigeria. All the participants were visited at home and verbal consent obtained from the parents and guardians.

One stool sample per child was collected and examined microscopically for parasites, hookworm speciation to determine *necator*

*americanus* was carried out by cultural methods.<sup>8</sup> All parasite positive children were further screened to document symptoms, clinical features and their blood samples obtained for biochemical investigations. Parasite burden was estimated by concentrating approximately 2.5g of each stool specimen by the formal ether technique.<sup>9</sup>

Worm burden estimation was carried out for samples that were positive for *Ascaris*, and were categorized as heavy (3 or more eggs/per 10 x field) and moderate (1-2 egg/per field) as previously described.<sup>6</sup> The biochemical tests conducted on the study and control participants included total serum protein,<sup>10</sup> serum albumin,<sup>11</sup> plasma Vit C,<sup>12</sup> vitamin E and packed cell volume (PCV).<sup>13</sup>

Statistical analysis was done by computer software Instat graph pad version 2.05a. Data are displayed in simple frequency and percentage tables. Categorical variables were compared using Chi square test while quantitative variables were compared using t-test and analysis of variance. P value 0.05 was taken as significant statistically.

## RESULTS

*Intestinal helminths by age:* A total of 239 children were enrolled and had their stool samples collected, 147(61.6%) of the stool were positive parasite species. The most prevalent intestinal helminth was *Ascaris lumbricoides* 105(43.9%), *Trichuris trichuria* 28(11.7%) and Hookworm 14(5.9%). Table-I.

*Sex distribution of intestinal helminths:* Females were more infected 80(54.4%) than males 67(45.6%). The most prevalent intestinal helminth was *Ascaris lumbricoides* amongst the males 47(32.0%) and 58(39.5%) amongst the

Table-I: Distribution of Intestinal helminthiasis by age

Age	No. screened	No. (Pos)%	<i>Ascaris</i>	<i>Trichuris</i>	Hookworm
6m – 5yrs	(n=62)	35(23.8%)	25(40.3)	8(12.9)	0(0)
> 5yrs – 10yrs	(n=135)	79(53.8%)	57(53.3)	14(50.0)	10(71.4)
>10yrs – 16yrs	(n=42)	33(22.4%)	23(21.5)	6(21.4)	4(14.3)
Total	(n=239)	147(61.6%)	105(43.9%)	28(11.7%)	14(5.9%)

No: Number Pos: Positive

females. This was followed by *Trichuris trichuria* 12(8.2%) in males and 16(10.9%) in the females. The least prevalent was hookworm, 8(5.4%) in males and 6(4.0%) in females.

*Symptoms and clinical signs amongst infected children:* Diarrhea was the commonest complain 40(27.2%), rectal prolapse was seen in 10(6.8%) of the children. Twenty three (15.6%) children complained of weakness, pallor was demonstrated in 15(10.2%) of them, 4(2.7%) had congestive cardiac failure, 5(3.4%) had pneumonia and 3(2.0%) had wheezing. Of the 15(10.2%) children with pallor, digital clubbing was present in 5(3.4%) and these 5(3.4%) also had pica as complain. Vomiting was not frequent only 4(2.7%) cases.

*Effects of social class on intestinal helminthiasis:* Children of lower social class were more infected 83(56.5%) compared to the middle social class children 64(43.5%). More children in the low social class had moderate infection (41.0%) compared to those in the middle class with (30.5%) while for heavy infections 15.2% and 13.3% were recorded among children of low and middle class respectively.

*Distribution of Ascariasis lumbricoides worm burden according to age group:* Of the 27(25.2%) children were between 6 months to 5 years of age, 17(16.2%) were moderately infected while 10(9.5%) had severe infection. Thirty one (29.5%) of the children aged between 5 years and 10 years had moderate infection while 24(22.9%) were severely infected. The least in-

tensity of infection was seen among children aged between 10-16 years, as only 23(21.9%) had moderate intensity of infection, no heavy load of ascariasis was recorded in this age group.

*Biochemical profiles of children infected with Ascariasis lumbricoides:* Plasma vitamin C, E total serum protein, albumin and PCV were significantly lower in children that are heavily and moderately worm burdened, Table-II.

## DISCUSSION

This study showed that a high proportion of our rural children are still burdened by intestinal parasitoses and *Ascaris lumbricoides* was the most prevalent amongst the children in Edo State. Our prevalence rate is similar to an earlier reported finding in a study of school children in Benin City, Edo State.<sup>14</sup> Intestinal parasites are known to be distributed according to climate, human population and human activities as well as social and health habits.<sup>1</sup> We found a higher number of females to be infected than males, which supports an earlier finding in Benin.<sup>14</sup> Children aged 5 – 10 years were most infected with *Ascaris lumbricoides* compared to the other age groups for both sexes. It is likely that children within this age group were most exposed to infection with *Ascaris* especially when at play in contaminated environments.<sup>15</sup>

Poverty and ignorance might have been important predisposition of the children to

Table-II: Biochemical profiles of children infested with *Ascariasis lumbricoides*.

Variable	Moderate infestationn = 71	Serious infestationn = 34	Control n = 50	P-value	S/NS
Plasma Vit. C (mg/dl)	0.49 ±0.20	0.34 ±0.18	0.59 ±0.22	<0.0001	S
Total plasma serum (g/L)	60.3 ±5.5	59.6 ±3.6	64.5 ±4.0	0.0001	S
Plasma Albumin (g/L)	36.6 ±6.2	28.5 ±2.1	38.5 ±6.3	<0.0001	S
Packed cell volume (%)	32.3 ±3.8	25.9 ±3.7	33.4 ±2.6	<0.0001	S
Vitamin E (mg/dl)	3.28 ±66	2.76 ±0.44	3.66 ±0.8	<0.0001	S

S = Significant statistically

NS = Not Significant statistically

frequent intestinal infections. Our finding is similar to that reported by Luis et al<sup>16</sup> that employment status and education of mothers are important factors in the prevalence of intestinal parasitic infections.

The mean plasma total protein and albumin are lower in our children moderately and severely infected with ascariasis, these findings are supported by other studies,<sup>17,18</sup> which report intestinal loss of 7% - 9% of dietary fat as well as abnormal carbohydrate (d-xylose absorption) in subjects infected with ascariasis. This study also showed that children infected with ascariasis had low vitamin C compared to uninfected controls. This finding corroborates an earlier report by Dodin,<sup>19</sup> who demonstrated abnormally low vitamin C excretion in his subjects infected with ascariasis and other parasites. The reason for the low vitamin E levels may be traceable to the malabsorption syndrome in hosts infected with ascariasis, because of the parasites interference with duodenal and jejunal function.<sup>20</sup>

The mean packed cell volume was also lower in children with ascariasis compared to controls, probably because of the malabsorption, malnutrition and protein losses as supported by other studies<sup>7,17,18</sup> and exemplified by low total plasma protein, albumin, vitamin C and vitamin E in this study. The low PCV, may explain why weakness was a common complain and pallor as demonstrated in 23(15.6%) of the children. Some of the anaemic children presented with pica, dyspnea and congestive cardiac failure in extreme cases. The pica is a symptom of iron deficiency anaemia. Iron deficiency has been reported as a symptom of hookworm infection.<sup>7</sup> The pneumonia and the wheezing may have been caused by *Ascaris* larvae migrating through the lungs at the time of physical examination. The rectal prolapse is a symptom of *Trichuris trichuria*.

Diarrhea in children with intestinal helminthiasis may have multiple origin; apart from the direct physical effects by the parasites, in the GIT, intestinal parasites may cause malabsorption, malnutrition as well as avitaminoses,<sup>6</sup> which could worsen the diarrhea. These

multiple causes and effect relationship may explain why diarrhea is a common presentation in children with intestinal helminthiasis.

## CONCLUSION

Intestinal heminthiasis moderate and severe infections are associated with various morbidities exemplified by clinical and laboratory findings. Findings of this study should serve to re-emphasize the need to support and implement programmes that are aimed at the control of intestinal parasites especially among the rural populace in the tropics and possibly elsewhere.

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