

# Prevalence of Hookworm Infection Related Anaemia Among Okeh Memorial Junior and Senior Secondary Commercial School Students in Elele Rivers-State Nigeria

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## Abstract

A total of 750 stool and finger prick blood samples each were collected randomly from Okeh Memorial Junior Secondary Commercial School (OMJSCS) students and also from Okeh Memorial Senior Secondary Commercial School (OMSSCS) students in Elele to determine the presence of Hookworm and level of packed cell volume (PCV). Standard diagnostic methods were used for the analysis. Out of 750 stool samples analysed, 39(5.2%) were positive for the ova of Hookworm. Age group 10-11 years had the highest percentage of occurrence 17(14.4%), while no case of infection was recorded from 18 years and above. Female students were more infected 21(7.7%) than male students 18(3.8%), and OMJSCS had more infected cases 32(8.5%) than OMSSCS 7(1.9%). Packed cell volume reduced with high parasitemia level. Improvement of sanitation and provision of health care facilities are required to control and eliminate all intestinal parasitic infections in the area after preventive measures.

**Keywords:** Prevalence; Hookworm; Packed cell volume; Parasitemia; Elele

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## Introduction

Intestinal helminthes are types of intestinal parasites that reside in the human gastro intestinal tract. They represent one of the most prevalent forms of parasitic disease. Scholars estimate that over a quarter of the world's population is infected with an intestinal worm of some sort, with roundworm, hookworm and whipworm infecting 1.47 billion people, 1.05 billion people respectively [1]. Because of their high morbidity and lower standards of hygiene, school-age children are particularly vulnerable to these parasites [2]. Children may also be particularly susceptible to the adverse effect of helminth infection due their incomplete physical development and their greater immunological vulnerability [2].

Soil-transmitted helminths (STHs) are groups of nematodes that infect more than one billion people worldwide [3]. Detailed information on its prevalence in many countries is scanty. In Nigeria, the prevalence of Hookworm infection among secondary school students in Vom was estimated to be 3.2%. Hookworm infection occurs in predictable areas where sanitary and environmental conditions favour the development of filariform larvae and the infection of the host hookworm are the "Vampires"

of the gut, feeding by sucking blood from the capillaries of the intestinal mucosa.

In developing countries where control measures are often difficult to implement, STHs remain a significant health problem [4,5]. It is estimated that between a quarter and third of the infected persons and pregnant women in Sub-Saharan Africa are infected with hookworm and which gives rise to preventable hookworm-related anaemia [6]. Hookworm infection may also elicit potent immune system [7,8]. Infections with hookworm may have important health consequences during the developmental stage, affect child health and development, slowing down growth and reducing adult productivity and work capacity [5,4,9]. Because

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of lack of enough data concerning the prevalence of Hookworm infection in Elele community, it is therefore essential to ascertain the prevalence rate of students with hookworm infection among those schooling at Okeh Memorial Senior and Junior Secondary Commercial School in Elele Rivers State Nigeria.

## Materials and Methods

### Sample collection

Wide mouth plastic specimen bottles with screw caps were given to Okeh Memorial Junior Secondary Commercial School (OMJSCS) and Okeh Memorial Senior Secondary Commercial School (OMSSCS) students for the collection of stool samples in the morning. Blood samples were also collected from each student through finger prick into capillary tubes (Heparinized) and sealed with plastacine. About 750 (blood and stool) samples collected from OMSSCS and OMJSCS students were taken to the laboratory for analysis.

### Sample processing

Stool Samples were examined for parasites using standard methods. Macroscopic examination of stool samples was followed by direct saline preparation for ova and iodine preparation for cysts. Mounted wet saline and iodine preparations were examined under light microscope using X10 and X40 objectives and the parasite stages identified as described by WHO (1991). Packed cell volume (PCV) was determined using micro haematocrit method as described by [10].

## Results

Age and sex distribution of hookworm infection is presented in (Tables 1 and 2). Out of 750 stool samples examined, 39 (5.2%) harboured ova of hookworm. OMJSCS recorded the highest prevalence of infected cases 32(8.5%) than OMSSCS with 7(1.9%), and female students were more infected than males. Age group of 10-11 years recorded the highest number of infected cases 17(14.4%), followed by 12-13years with 7(6.5%) while no positive case was reported from 18 years and above. Table 3 shows the age and sex distribution of mean packed cell volume. It was observed that packed cell volume reduced as the level of parasitemia was increasing.

## Discussion

Helminths often find their way into a host through eating infected food, drinking contaminated water and walking on infected soil. This is especially a problem in the developing world where hygiene is usually relegated to the background. Some children walk and play bare-footed in filthy environments and by so doing contact diseases and helminthes [11]. The most important of nutritional stress resulting from helminth infections is Hookworm associated with iron –deficiency anemia. It is documented that light hookworm infection of 20-50 adult worms can result in significant iron losses [12]. This study presented an overall hookworm infection prevalence rate of 5.2%. These findings corroborate the reports of Hurtado M et al. [13], that high prevalence of intestinal parasites is consistent with what is found throughout indigenous population in rural tropical areas. The

**Table 1** Age and sex distribution of Hookworm infection among OMSSCS (Okeh memorial senior secondary commercial school) and OMJSCS (Okeh memorial junior secondary commercial school) students.

Age (years)	Sex	Number of cases examined	Number of positive cases	Percentage occurrence (%)
10 – 11	F	68	10	14.4
	M	48		
12 – 13	F	41	3	6.5
	M	67		
14 – 15	F	68	2	6.2
	M	110		
16 – 17	F	59	1	1.7
	M	175		
18 – 19	F	19	2	0.0
	M	50		
20 – 21	F	8	0	0.0
	M	13		
≥ 22	F	10	0	0.0
	M	14		
Total:		750	39(5.2)	28.8

**Table 2** Sex distribution of Hookworm infection among OMJSCS (Okeh memory junior secondary commercial school) and OMSSCS (Okeh memory senior secondary commercial school) students in Elele, Rivers-State, Nigeria.

School	Male		Female		Total	
	No of cases examined	No of infected cases	No of cases examined	No of infected cases	No of cases examined	No of positive cases
OMJSCS	201	13 (6.5)	177	19 (10.7)	378	32 (8.5)
OMSSCS	276	5 (1.8)	96	2 (2.1)	372	7 (1.9)
TOTAL	477	18 (3.8)	273	21 (7.7)	750	39 (5.2)

**Table 3** Age and sex distribution of Mean Packed cell volume (PCV) of OMJSC and OMSSCS students in Elele, Rivers-State, Nigeria.

Age (Years)	Sex	No of cases examined	Mean PCV (%)	No of infected cases
10 – 11	F	68	24	10 (14.7)
	M	48	25	7 (14.6)
12-13	F	41	25	3 (7.3)
	M	67	27	4 (5.9)
14-15	F	68	30	2 (2.9)
	M	110	32	9 (8.2)
16-17	F	59	29	1 (1.7)
	M	175	33	3 (1.7)
18-19	F	19	39	0 (0.0)
	M	50	37	0 (0.0)
20-21	F	8	38	0 (0.0)
	M	13	39	0 (0.0)
≥ 22	F	10	37	0 (0.0)
	M	14	40	0 (0.0)

prevalence of hookworm in this survey was higher than reports of Odebunmi JF et al. [14] with 3.2%. The prevalence obtained in this study was generally attributed to the poor faecal disposal system, also the fact that most of the children remove their shoes and play barefooted might have exposed them to infective stage of hookworm larvae. The use of excreta as manure commonly practiced by vegetable farmers might also act as a vertical source of the infection since children and their mothers often go to the farm to attend to the vegetables [15]. The prevalence rate was higher among Okeh Memorial Junior Secondary Commercial School students (8.5%) than the students from Okeh Memorial Senior Secondary Commercial School with (1.9%) which could be justified by the standard facilities and personal hygiene which benefit the Okeh Memorial Senior Secondary Commercial School students, while Okeh Memorial Junior Secondary Commercial School students are younger and might not be fully compliant with personal hygiene measures [16].

This work also showed that females recorded the highest prevalence (7.7%) of hookworm, while males had (3.8%). This finding is in agreement with the report of Odebunmi JF et al. [14] which states that the prevalence of hookworm was higher in females (6.5%) than in males (1.9%) among school children in Vom. This could be attributed to the fact that females usually follow their mothers for farming activities and spend more time in muddy, wet gardens suitable for third stage infective hookworm larvae. The high prevalence of hookworm may also be due to the nature of the parasite-host relationship [3]. One way in which intestinal helminths may impair the development of their hosts is through their impact on nutrition. Intestinal helminth infection has been associated with problems such as vitamin deficiencies, stunting, anaemia and protein-energy malnutrition, which in turn affects cognitive activity and intellectual development [17]. In

this present study, the association between the ova of hookworm density and packed cell volume (PCV) in these subjects suggests the likelihood that anaemia may occur with further degree of parasitemia, which is in agreement with the reports of [18-20]. The observation in this study that the packed cell volume reduced with high level of parasitemia corroborates with the saying that helminthes may also affect nutrition by inducing iron-deficiency anemia; and this is most severe in heavy hookworm infection as *N. americanus* and *A. duodenal* feed directly on the blood of their host. Although the impact of individual worm is limited (each consume about 0.2-0.7 ml and 1.4-2.6 ml of blood daily, respectively) [21,22].

## Conclusion

Anaemia has also been associated with reduced stamina for physical labour, a decline in the ability to learn new information, irritability and fatigue. The highest prevalence was recorded in age group 10-11 years (14.4%), followed by age group 12-13 years (6.5%). This was in accordance with the work of Holland CV et al. who identified helminth infection among age group 10-15 years. There was no infection between age group 18-22 years. The presence of hookworm infection among these students is of serious public health concern, as heavy hookworm infection acts as “as very real barrier to children’s progress in school”, which will eventually translate to absenteeism, under-enrollment and attrition. There is need for school deworming programs which have shown strong positive benefits used a difference-in-difference model to prove that deworming programs in some schools reduced the burden of diseases. Hookworm infestation especially among children is of serious public health concern; efforts should be made towards deworming them from time to time.

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