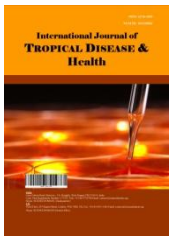

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Intestinal Parasites in School-Aged Children of Rumuodogo, Emohua Local Government Area, Rivers State, Nigeria

H. O. Chukwu [a*], O. Owhoeli [a] and C. C. Amuzie [a]

[a] Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aim: This epidemiological survey was carried out to assess the prevalence of intestinal parasites in School aged Children.
Place and Duration of study: The study was carried out in Rumuodogo Community in Emohua Local Government area of Rivers State, Nigeria between the months of March to June 2019.
Methodology: Microscopic examination of stool samples from 200 school-aged pupils between the ages 3-18 years was carried out using formol-ether concentration and direct wet mount, and stained iodine. Demographic as well as epidemiological data were obtained using a questionnaire.
Results: The finding reveals an overall prevalence of 49.5%. However, there was a significant difference in the parasite prevalence values between the age groups (P = 0.01). The common intestinal parasites identified were *Ascaris lumbricoides* 19.5%, *Ancylostoma duodenale* 9.5%, *Trichuris* spp. 6%, *Strongyloides spp. 4.5%, Enterobius* spp. 1%, *Taenia solium,* 1.5%, *Taenia*

**Corresponding author: Email: harrison.obodo@ust.edu.ng, harrisonweizi@yahoo.co.uk;*

saginata 1%, Entamoeba histolytica 4.5%, Giardia lamblia 4% and Schistosoma mansoni 2%. The prevalence of intestinal parasites infections with respect to the available and use of toilet facility revealed that *Pit toilet users had the highest prevalence of 62 (56.9%) while no infection was recorded among users of water closet toilet. When age groups were compared, the result showed that age group 3-6 years were significantly more infected than the other age groups (P = 0.01). There was no significant difference between other age groups.* The findings however, showed that age groups 6-10 years had the highest prevalence of 55.6%. Maximum of seven children had multiple infections. The male female ration was 62:37 while the percentage for males was 43.2% and 50% for females.

Conclusion: Intestinal parasitic infections are associated with reduced development of children manifested by a reduced physical fitness which may result from vitamin deficiencies, inducing intestinal bleeding, and protein energy malnutrition. Therefore, the high prevalence of intestinal parasites recorded in this study calls for an intensified effort in the control of the infections. Regular deworming of children and environmental sanitation should be carried out to further reduce the prevalence.

Keywords: Parasites; children; school; rumuodogo.

1. INTRODUCTION

Inspite of the tremendous advances in medicine and clinical Parasitology, globally over the past few decades, human intestinal parasitic infections remain the single largest cause of human death and discomfort in school children and poor communities. These infections are the most prevalent in the tropical and sub-tropical regions of the world, where adequate water and sanitation are lacking [1]. The major factors that contribute to transmission and prevalence of intestinal parasitic infections, especially in endemic areas of the tropics, are poor environmental sanitation, poor hygiene practices, indiscriminate disposal of human and animal feces. These result to the contamination of the environment which predisposes humans to infections due to unhygienic practices due to poverty [1,2]. Reports by the World Health Organization [3] puts the figure of infected children worldwide at 880 million. This high infection is due to severe shortage in health care, education, sanitation, transport and chronic poverty [4].

Intestinal parasitic infections could have significant effect on the growth and development of children which manifests as reduced physical fitness and constrained growth due to problems such as vitamin deficiencies, inducing intestinal bleeding, and protein energy malnutrition associated with their effects. There might equally be a subtle but important development effect on cognition and educational development [4, 5, 6].

These infections may also pose some serious consequences on human health, such as hepatomegaly, oesophageal varices and bleeding [7]. Individuals infected with helminths according to Mulu *et al.* [8], could be susceptible to other infections such as malaria and HIV.

Intestinal parasites especially *Ascaris lumbricoides*, *Trichuris trichuira* and hookworm species are most common in Nigeria. Prevalence of these parasites especially Ascaris, according to Ovutor *et al.* [1] and Olaniyi *et al.* [9] has remained unchanged in the last 50years and poly-parasitism occurs. Eze *et al.* [4] reported a 70% prevalence of intestinal helminths in school children of Khana, Rivers State, Nigeria. Mafiana, [10] equally reported 70.8% prevalence in Ilewo Ogun State Nigeria. This present study was carried out to determine the prevalence of intestinal parasites in school-aged children in Rumuodogo Town, Emohua, Rivers State, Nigeria.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in Rumuodogo community in Emohua Local Government Area of Rivers State, Nigeria. It is located at latitude 4^0 53'0 North and longitude 6'52'0 East of the Greenwich. The area lacks social amenities. The vegetation is rainforest and the humidity is very high. The community is surrounded by both fresh and saline waters and their major occupations are subsistence farming and fishing.

2.2 Collection of Stool Samples

Morning stool samples were collected using sterile vials from 200 pupils with the help of

their parents. The specimens were preserved in 10% formalin and transferred to the Animal and Environmental Biology laboratory of Rivers State University, Nigeria, for analysis.

2.3 Examination of Stool Samples

2.3.1 Formol-ether concentration technique

This method was adopted from Cheesbrough [11]. About 1g of the stool was emulsified in about 4ml of 10ml of formol solution in a test tube. The formol solution was prepared by mixing 50% strong formaldehyde solution with 450ml distilled water. 4 ml of the formol water was added to the solution and mixed properly by shaking; the mixture was filtered into a test tube using a cloth gauge and about 3-4ml diethyl ether was added and shaken vigorously and allowed to stand for 2 minutes. The mixture was centrifuged at 1000 revolutions per minute for 3 minutes. Using a glass rod, the faecal debris from the side of the tube was loosened and the test tube inverted to pour off the supernatant leaving the deposit at the bottom of the test tube in an upright position. The deposit was mixed by tapping the tube with the finger and using a Pasteur's pipette, a drop of the deposit was applied on a microscope slide mixed with Lugol's iodine, covered with a cover slip and viewed under the microscope with X10 and X40 objective respectively. The eggs and larvae of the parasites were identified with reference to Atlas of Parasitology.

2.3.2 Direct wet preparations

A little portion of stool was mixed with 2 drops of 0.85% saline solution on a slide. A drop of iodine was added and examined under the microscope [11].

2.4 Data Analysis

Data were entered into Microsoft Excel 2010, logarithm transformed (to base 10) and analyzed using one-way analysis of variance [12].

3. RESULTS

Table 1 shows 49.5% prevalence of intestinal parasites in the study area, with children between ages 3-6 having the highest prevalence of 56.4% while ages 15-18 recorded the least.

Table 2 shows the prevalence of intestinal parasites with respect to sex. The result shows that the male pupils had a higher prevalence (62%) than their female counterparts which had 37.5%.

Table 3 shows that *Ascaris lumbricoides* had the highest prevalence of 19.5% while *Schistosoma mansoni and Enterobius vermicularis* had the least prevalence in the study area.

Table 4 indicates pit toilet users had the highest prevalence of 56.9% than those who used bush as well as water closet that didn't record any incidence.

4. DISCUSSION

There has not been any report of work on the prevalence of intestinal parasites among school-aged children in the study area. From the results of this study, high prevalence (49.5%) observed possibly may be due to poor hygienic condition of the area and thus the various intestinal parasites recorded.

The prevalence of 49.5 recorded in this study was lower when compared with 66.3%observed by Agi [13] in Choba community, 70% by Eze *et al.* [4] in Sii, Gwara and Gure communities in Khana Local Government Area in Rivers State and 72% finding by [14] in University of Guyana, Georgetown, Guyana.

Ascaris lumbricoides was the most prevalent parasite encountered in the study followed by hookworm and *Trichuris* species. This could be attributed to the involvement of the people in agricultural practices of farming and fishing or lack of adequate personal hygiene. Hookworm infection maybe as a result of walking or playing on infested soils bare footed.

Findings are equally in line with the report of Michael *et al*. [15] who found a high prevalence of *Ascaris lumbricoides* among communities in the vicinity of Port Harcourt. Also, Abah and Arene [16] reported *that Ascaris lumbricoides* occurred more frequently (51.78%) among primary school-aged children in Rivers State, Nigeria.

Table 1. Age related Incidence of intestinal parasites in School-Aged Children in the study area

Age groups in years	No. Examined (%)	No. Positive (%)	No. Negative (%)
3-6	62 (31)	35 (56.4)	27(43.5)
7-10	72 (36)	40 (55.5)	32 (54.0)
11-14	37 (18.5)	17 (45.9)	20 (54.1)
15-18	29 (14.5)	7 (24.1)	22 (75.9)
Total	200	99 (49.5)	101 (50.5)

Table 2. Sex related incidence of intestinal parasites amongst school-Aged Children in the area

Sex	No. Examined (%)	No. Positive (%)	No. Negative (%)
Male	125 (62)	54 (43.2)	71 (56.8)
Female	75 (37.5)	45 (60)	30 (40)
Total	200	99 (49.5)	101 (50.5)

Table 3. Incidence of intestinal parasites species in relation to age groups

Species of Parasite	Age groups (Years)				
	3-6	7-10	11-14	15-18	Total
Ascaris lumbricoides	18 (9)	13 (6.5)	4 (2)	4 (2)	39 (19.5)
Hookworm sp.	7 (3.5)	6 (30)	4 (2)	2 (1)	19 (9.5)
Trichuris trichiura	3 (1.5)	5 (2.5)	3 (1.5)	1 (1.5)	12 (6.0)
Strongyloides stercoralis	2 (1)	4 (2)	3 (1.5)	0	9 (4.5)
Enterobius vermicularis	2 (10)	0	0	0	2 (1)
Schistosoma mansoni	2 (1)	1 (0.5)	1 (0.5)	0	4 (2)
Taenia sp	2 (1)	3 (1.5)	0	0	5 (2.5)
Entamoeba histolytica	2 (1)	5 (2.5)	0	2 (1)	9 (4.5)
Giardia lambia	4 (2)	4 (2)	0	0	8 (4)
Total (200)	42 (21)	41 (201.5)	15 (7.5)	9 (4.5)	107 (53.5)

Table 4. Incidence of intestinal parasites with respect to dominant toilet facility in the study area

Toilet Facility	(%) No. Examined	(%) No. Positive	(%) No. Negative
Bush	88	36 (40.9)	52 (59.0)
Pit	109	62 (56.9)	47 (43.1)
Water closet	3	0	3 (100)
Total	200	98 (49)	102 (51)

The data shows that females had a higher prevalence of 60% which may be as a result of being involved in domestic and agricultural activities which predisposes them to polluted environments. The male work in farms, far from homes and are less exposed to heavily polluted home environment and consequently less infected. This is consistent with Ephrem *et al*. [17].

In the case of the most toilet facility (pit) used, most people in the area are poor and unable to afford water closet. Table 4 shows that the pit latrine users had a comparatively high prevalence of (56.9%) than bush toilet system. The result is in agreement with Mordi and Paul [18] who observed a high percentage of parasitic infections in Benin City among pit toilet users. But the bush users had a prevalence of (40.9%) which is equally high. This practice is a product of underdevelopment and shows lack of personal and community hygiene. The use of bush and pit as toilets is a major source of soil and water pollution which is responsible for the high incidence of soil transmitted helminth parasites in Nigeria [1,4].

The high prevalence (55.5%) of the parasites among age group 6-10 years may be as result of the children in this age group walking barefooted

around homes, while going to school and swimming in contaminated streams. The infection decreased in ages 11-14 and ages 15-18. This is consistent with Mafiana [10] who noted 82.1% prevalence in children aged 10-11 years. This sequence may be attributed to the fact that children in older age groups had behavioural patterns different from those of the younger groups; more knowledge of disease, and a little improvement on personal hygiene.

Gairdia lambia and *Entamoeba histolytica* had a prevalence of 4 and 4.5% respectively which was higher when compared to findings by Akaniwo [19] who recorded a 2.5% prevalence in Obio/Akpor but lower when compared to 11.7% observed by Mercado *et al.* [20] in Chile. Poly-parasitism was observed in 7 out of the 200 faecal samples. The co-existence of the different parasites in the infected individuals is an important feature in the biology of these parasites. This is so because the acquisition of single infection produces a different effect from acquisition of large number of worms.

5. CONCLUSION

It was observed from this study that poverty (which led to ignorance as a result of lack of education and good environmental sanitation (through proper waste disposal system), poor personal hygiene and shortage of drinking water) contributed to the level of infection reported in the study. Therefore, health facilities, pipe borne water, education through enlightenment programmes and improved sanitary conditions should be provided since the infections are aided by unavailability of potable water and poor sanitary conditions.

CONSENT AND ETHICAL APPROVAL

Approval for the study was given by the school authorities and written consent was obtained from the parents and guardians of the children.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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