# Study of Neglected tropical diseases (NTDs): Gastro-Intestinal Helminthes among school children in Port Harcourt, Rivers State, Nigeria

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**Abstract :** This study reports on detection and prevalence of intestinal parasites among school children in Port Harcourt, the capital city of Rivers State, Nigeria. Stool samples were collected from 100(46.5%) males and 115(53.5%) females. Microscopic examination of both thin and thick films of the stool sample were done. In all, three intestinal helminthes were identified. The overall prevalence was 30.7% and this was predominantly among male school children (37.0%) than in females (25.2%) from both locations. Of the three parasite species observed, *T. trichiura* (39.4%) was the most predominant helminthes in this study. This was closely followed by *A. lumbricoides* (33.3%) and hook worm (27.3%) was the least. Generally, intestinal helminthes was most predominant in samples from Emohua State Primary School (ESPS), Emohua (90.9%) than those from University Demonstration Primary School (UDPS) in Choba (9.1%)]. Intestinal helminthes were most predominant among children aged 10-15 years (57.6%) than those within age group 5-9 years (42.4%) of age from both locations. It further showed that among the male school children, *A. lumbricoides* (63.6%) was most predominant, followed by hook worms (55.6%) and *T. trichiura* (50.0%) was least predominant. There were no incidence or prevalence of multiple infections of any of the three helminthes in the study. This study shows that a good percentage of people were infested by parasitic protozoa and worms and reinforces the need for an urgent effort to check the unnecessary and avoidable heavy parasites load.
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## 1.0. INTRODUCTION

Neglected tropical diseases (NTDs) are a group of parasitic infections that are among the most common infection in the world poorest populations (Hetez et al., 2007). The most prevalent NTDs are due to helminthes, lymphatic filariasis, soil – transmitted helminthiasis (including Ascariasis, trichuriasis and hook worm infections) schistosomiasis and food – borne trematode infections (Sachs et al., 2006). These NTDs are commonly caused by helminthes. Helminthes are worms classified as parasites. More than 72 species of protozoa and helminthes can lodge in humans; most are considered food and water-borne zoonoses (Jimenez-Gonzalez et al., 2009). The parasites frequently encountered include *Ascaris lumbricoides*, hookworms, *Trichuris trichiura*, *Strongyloides stercoralis*, *Giardia lamblia*, *Enterobius vermicularis, Ancyclostoma duodenale, Necator americanus,* and some species of *Schistosoma* as well as *Entamoeba histolytica* (Awolaju and Morenikeji, 2009).

Gastro-intestinal parasites are identified as a cause of morbidity and mortality throughout the world particularly in the under developed countries. They are one of the most common infections in humans especially in tropical and sub-tropical countries (Awolaju and Morenikeji, 2009). Intestinal parasitic diseases remain a serious public health problem in many developing countries especially due to fecal contamination of water and food (Jimenez-Gonzalez et al., 2009).

Soil transmitted helminthes (STHs) infections are important factor contributing to malnutrition in this age group (Stephenso et al., 2000). Soil transmitted helminthiasis (STHs) are *Ancylostoma duodenable*, *Necator americanus (hook worms)* and *Trichuris Trichuria* (Whipworm). STHs infections are widespread globally. In some species and regions, people with multiple infections are more common than those with either an infection or a single infection (Okolie et al., 2008; Okonko et al., 2009).

*Ascaris lumbricoides* is the commonest and well known geohelminths among others such as *T. trichiura*, Hookworm and *S. stercoralis*. The prevalence of infection with soil transmitted parasites is approximately one billion people world-wide with school children being the most heavily infected group. It is estimated that over one billion people are infected with *A. lumbricoides* (Chukwuma et al., 2009).

Hook worm infestation has been recognized as an important cause of iron deficiency anaemia for decades. Intense whipworm infection in children may result in Trichuris dysentery syndrome, the classical signs of which include growth retardation and anaemia. Heavy burdens of both roundworm and whipworm are associated with protein energy malnutrition (Stephenso et al., 2000). These infections could have significant effect on the development of children manifesting as reduced physical fitness and somewhat constrained growth. There might also be subtle, but important development effect on cognition and educational achievement (Jukes et al., 2007). Recognition of these potential consequences of infection has led to increasing emphasis on community based anthelmintic treatment to reduce worm burdens in children irrespective of direct evidence of infection particularly children of school age as reported by Bundy et al. (2006) and Bethony et al. (2006).

The current focus on school children reflects three factors; the evidence of an effect on weight and cognition in this age group; the accessibility of school children to treatment delivered through the education infrastructure; and the epidemiological observation that school children tend to harbour the largest worm burdens (Bundy et al., 2006). The control of neglected disease is considered a crucial step towards achieving the majority of the eight millennium Development Goals (Fenwink et al., 2005) but despite the availability of cost – effective and successful control or elimination interventions, large numbers of the world's poorest individuals remain afflicted with these diseases (Molyneux, 2004).

Although several studies indicate that helminthes infections are highly prevalent among children (Mafiana et al., 2000). There is no report on statewide prevalence for intestinal helminthes except for Ascariasis (Sam – Wobo et al., 2005). Also there are no available data about the demography and hygienic conditions of the state's schools to help guide the development of school health programmes which are requirement for sustainable control of soil – transmitted helminthes in school children. Presently, there is no national school based parasites or soil – transmitted helminthes control programmes in Nigeria. In the past, there have been sporadic and uncoordinated de-worming programmes under taken by government official without any baseline information or data.

Few studies have examined the impact of infection on younger children, partly because of burden of worms and, it has been assumed that disease is light at the early age and perhaps because of the practical difficulty in reaching the pre-school population. Two recent studies from Africa, however, suggest different conclusion. A study of de-worming children in Port Harcourt, Nigeria, showed there was a significantly high level of reduction in worm infestation and worm load (Odu et al., 2011). While a study of de-worming pre–school children during "health days" in Uganda increased growth rate and was cost – effectively (Alderma et al., 2006). PSAC (pre – School Aged Children comprise between 10% and 20% of the 3.5 billion people living in Soil transmitted helminthes (STHs) endemic areas (WHO, 2006), and although these infections are not among the big killers, they endanger children's health in a subtle and debilitating way, chronic infections compromise healthy growth, cognitive development, physical fitness, and iron status and affect immune response of infected children (Albonico et al., 2008).

An intense advocacy effort has been the support of donor partnerships integrated the control of the major NTDs into their national health programs (Hetez et al., 2007). For these reasons, de-worming has now become an essential component of school health programs in many developing countries (Odu, et al., 2010).

Estimates of these parasitic diseases thus become a matter of necessity for the surveillance of public health, proper health-care delivery and people's welfare (Mordi and Ngwodo, 2007). Estimating the amount of morbidity or disease due to human helminthiasis is even more contentious than trying to calculate the number of infections. Many people who harbor a helminthes infection may be symptomless, and physicians cannot always agree on what constitutes a clinical case of disease. Some of the hospital reports are sometimes questionable. Thus the authenticity and validity of such reports for the surveillance of public health become doubtful. Therefore, the need to have accurate, comprehensive, valid, and reliably documented information on parasitic diseases cannot be overemphasized.

Helminthes infections, though neglected in the past, are now back on the public health agenda and their control will have a lasting impact on the health of children in endemic countries (WHO 2001). Nigeria children certainly stand to benefit from this renewed interest in helminthes infection control. It is particularly noteworthy that school based helminthes control programs have been shown to practicable and well received at community level in Nigeria. Previous studies elsewhere in Nigeria have been along these lines. Among such studies are those of Mordi and Ngwodo (2007), Ajero et al. (2008), Okolie et al. (2008), Tohon et al. (2009), Chukwuma et al. (2009), Awolaju and Morenikeji (2009), Alli et al. (2011)

and Odu et al. (2010, 2011). This study therefore, reports on detection and prevalence of gastro-intestinal helminthes among school children in Port Harcourt, the capital city of Rivers State, located in the south-south region of Nigeria. It also aimed at determining the extent to which these gastro-intestinal helminthes were involved in the causation of acute diseases in an African set up.

## 2.0. MATERIAL AND METHODS

### 2.1. Study Area

The study area under survey for this project is from both urban and rural schools in Rivers State. The schools include University Demonstration Primary School (UDPS) Choba, Port Harcourt and Emohua State Primary School (ESPS) in Emohua Local Government Area, Rivers State. Port Harcourt has a population of about 1.8 million. It is located between latitudes $40^0$ $42^1$ N and $4^0$ $57^1$N and longitudes $65^02^1$ and $7^0$ $08^1$ E. It lies about 66km up the Bonny river. It is in the thick rain forest zone of Africa. The area has warm humid climate condition with high temperature and heavy rains distributed almost all the year round. While Emohua cut across latitude $4^0$ 52 N and longitude $6^0$ 52 E of the equator. It is the headquarters of Emohua local government area of Rivers State. It is situated on the South East margin of Niger Delta. Emohua is of the tropical rain forest belt with Greeks of the tropical mangrove swamp forest running through many villages in it. The inhabitants of Port Harcourt comprise of people from all part of Nigeria and even foreigners. Majority of people here are civil servants and traders only very few are agricultural workers. Generally, there is provision of some basic amenities like pipe-borne water and also hygienic toilet system (water closet system). While Emohua is a rural community and the inhabitants are mainly subsistence farmers. Members of this community depend on rain fall and river for water supplies (Table 1). Most houses lack toilet facilities and as such, defecation is done in the bush though some of them have pit toilets (Table 1). The farms are often situated near their houses and subsequently contaminated water may run into farms. Occasionally, the town becomes flooded after heavy rain fall as a result of poor drainage system, the condition of environmental pollution is still very poor as some streets still contain some excreta deposits.

### 2.2. Study population

A total of two hundred and fifteen consented school children (102 males and 113 females) from two state primary schools was recruited for this study. Their age ranges from 5-15 years of age. One hundred and one of them were from the rural locality and 114 of them were from the urban area (Table 1).

### 2.3. Sample Collection

This study, which lasted for six (6) months, was conducted from January 2002 to December 2004. A total of 215 stool samples were collected from children attending the rural and urban primary schools in Port Harcourt, South-southern, Nigeria. The samples were collected in sterile containers and transported to the laboratory for processing and to be analyzed. The samples were obtained by informed consent of the patients used for this study and the permission to that effect was obtained from the ethical committee. Other information such as sex, age, occupation of parents/guardians and the type of toilet in use at homes, environmental conditions of where they reside were collected using a performa specifically designed for this study. A survey form was also used to collect information on the schools' sanitation condition specifically: type of water supply conditions/ availability, the kind of toilet in use, availability of hand washing soap in class rooms, presence of cabbage cans in schools, presence of toilet lid, conditions of class rooms/playing ground (Ekpo et al., 2008). The stool samples were then fixed immediately in 10% formalin before taken to the laboratory for analysis.

### 2.4. Macroscopic Examination of Stool Samples

This describes the appearance of the stool i.e. the physical appearance such as colour, to know whether the stool is formed, semi-formed, unformed or watery, presence of blood/mucus, or pus. When a stool is unformed, containing pus and mucus the possible cause is shigella (shigellosis). When a stool sample is semi-formed and black hookworm disease is suspected. Unformed with blood and mucus stool possible cause is schistosomiasis. There are many appearance of faecal sample: Bloody diarrhea, watering stools, Rice water stools with mucous flakes etc. Blood can also be found in the stools of an individual suffering from haemorrhoids, ulcerative colitis, or tumours of the intestinal tract. A normal stool sample appears brown and formed or semi-formed. While for infants are yellowish – green and semi-formed. In this work the sample analyzed were without mucous or blood. But there are samples that are black and semi-formed, watery stool, and some appeared brown, formed or semi-formed.

### 2.5. Parasitological Analysis

Among the different parasitological techniques for stool analysis, formol - ether concentration technique as described by Cheesbrough (2006) was employed in this study. The procedure involved emulsifying about one gram (1g) of faeces with an applicator stick in a test tube containing 7ml of formalin solution it was well mixed, 3ml of ether was then added and mixed properly the tube was corked with cotton wool and shook vigorously in an inverted position and the stopper is removed with care. Each sample was made in this same way and the lest tubes were balanced in the centrifuge (Model: MINOR 35 from MST Ltd) and centrifuged at 1500 r.p.m for 5 minutes. At the end of centrifugation, the following layer were observed in the lest tube: ether at the top (colourless clear liquid); a plug of debris (dark coloured thick); formal solution (a colourful liquid with suspended debris) and a sediment (solid deposit at the bottom of tubes). The plug of debris was then removed from sides of the tube with an applicator stick. The first three layers were decanted down the sediment with a few drops allowed to drain back from the sides of the tube. A cotton swab was used to remove any debris adhering to the sides of the tube. The remaining sediments and the fluid that drained back were mixed properly by flicking the test tube. After which a smear preparation was made using a drop of iodine solution on a slide and the sediment was added and properly emulsified also on the left side of the slide a smear was made using normal saline covered with a over slip for microscopic examination. The X 10 and X 40 objective was used to examine the whole area under the cover slip for parasite ova, cyst and larvae. Slowly to the other end of the slide, iodine solution decolorized the parasite and making it more visible. In cases were debris were still found in the sample during examination the samples were subjected to the same procedure (formol – ether technique) describe above until it becomes much clearer.

**2.6. Identification of Worm (Ova, Larvae and Adult)**

Positive specimens were identified on the basis of microscopy. Using standard methods (CDC, 2007), a trained laboratory scientist at Department of Microbiology, University of Port Harcourt, Port Harcourt, Nigeria interpreted the microscopic slides of stool specimens. Several criteria were employed in recognizing the worms: *Ascaris lumbricoides* eggs were recognized on the basis of being round, ova or elliptical with rough membrane (fertilized) or they were a bit elongated and also has rough membrane (unfertilized). *Trichuris trichiura* were recognized by their barrel – shaped egg with transparent, mucoid polar plug at either ends. The hookworm (*Necator americaricanus* and *Ancylostoma duodenale*) has similar egg structure. The eggs were oval or elliptical with the larvae coiled within, thus, showing a clear zone between the embryo and the eggs shell.

**2.7. Enumeration of helminthes eggs**

The procedure for counting helminthes eggs in stool sample involves making a wet preparation of the sediment on a clean slide and covering the drop with a cover slip. Starting at one corner of the cover slip, the preparation was systematically examined under a light microscope, using X40 lens moving it back and forth across and noting the number of egg found.

**2.8. Data analysis**

The prevalence (P), defined as the percentage of infected individuals (NP) among the total number of individuals examined (N) (P= (NP/N) x 100) [33]. The helminthes density which is the mean number of eggs per gram of stool of each subject. The incidence rate (IN) which is defined as the ratio of the number of new positive samples detected one year after treatment to the number of negative samples obtained before treatment and during the control phases expressed as a percentage (Nkengazong et al., 2009).

**3.0. RESULTS**

The purpose of this study was to determine the prevalence of intestinal helminthes/parasites among school children in Port Harcourt area of Rivers State.

**3.1. Demographic characteristics of the school children**

Table 1 shows the demographic characteristics of the school children used in this study. Of the 215 school children in this study, 126 (58.6%) were in age group 5-9 years of age and 89(41.4%) in age group 10-15 years of age. It also showed that 100(46.5%) of the school children were males and 115(53.5%) were females (Table 1). It also showed that 114(53.0%) of the children were recruited from the University Demonstration Primary School (UDPS) in Choba, Port Harcourt, Rivers State and 101(47.0%) from the Emohua State Primary School (ESPS) in Emohua Local Government Area, Rivers State. Ninety-six (44.7%) of the children have bore- hole/tap water as their source of drinking water, 76(35.3%) had river/stream while 43(20.0%) had well as their source of drinking water. Also, 114(53.0%) of the school children uses water closet system as their toilet while 101(47.0%) uses pits and bushes as their means of toilet (Table 1).

**3.2. Frequency of occurrence of intestinal helminthes**

The findings of this study showed the occurrence of three (3) intestinal helminthes, namely round worms (*A. lumbricoides*), Whip worms (*T. trichiura*) and hook worms (*N. americanus*, *A.*

*duodenale*). Table 2 shows the frequency of occurrence of intestinal helminthes detected among urban and rural school children in River State. It showed that *T. trichiura* [26/66(39.4%)] was the most predominant helminthes in this study. This was closely followed by *A. lumbricoides* [22/66(33.3%)] and hook worm [18/66(27.3%)] was the least. Generally, intestinal helminthes was most predominant in samples from Emohua State Primary School (ESPS), Emohua [60/66(90.9%)] than those from University Demonstration Primary School (UDPS) in Choba [6/66(9.1%)]. Also, intestinal helminthes were most predominant among male children [37/66(56.1%)] than their female counterparts [29/66(43.9%)] from both locations. In relation to ages of school children, intestinal helminthes were most predominant among children aged 10-15 years [38/66(57.6%)] than those within age group 5-9 years 28/66(42.4%) of age from both locations. It further showed that among male school children, *A. lumbricoides* [14/22(63.6%)] was most predominant, followed by hook worms 10/18[55.6%] and *T. trichiura* 13/26(50.0%) was least predominant (Table 2).

**Table 1: Demographic characteristics of the school children used in this study**

| Profile | Total Examined (%) | Males (%) | Females (%) |
|---|---|---|---|
| **Age (years)** | | | |
| 5 -9 | 126(58.1) | 57(45.2) | 69(54.8) |
| 10-15 | 89(41.4) | 43(48.3) | 46(51.7) |
| **Sex** | | | |
| Males | 100(46.5) | 100(100.0) | 0(0.0) |
| Females | 115(53.5) | 0(0.0) | 115(100.0) |
| **Locality** | | | |
| Rural | 101(47.0) | 49(48.5) | 52(51.5) |
| Urban | 114(53.0) | 51(44.7) | 63(55.3) |
| **Study location** | | | |
| University Demonstration Primary School, Choba | 114(53.0) | 51(44.7) | 63(55.3) |
| Emohua State School Emohua Local Government Area | 101(47.0) | 49(48.5) | 52(51.5) |
| **Total** | **215(100.0)** | **100(46.5)** | **115(53.5)** |
| **Source of Water** | **Total Examined** | **Urban** | **Rural** |
| River/Stream | 76(35.3) | 0(0.0) | 76(100.0) |
| Well | 43(20.0) | 18(41.9) | 25(58.1) |
| Borehole/Tap Water | 96(44.7) | 96(100.0) | 0(0.0) |
| **Type of toilet** | | | |
| Pit/Bush | 101(47.0) | 0(0.0) | 101(100.0) |
| Water Closet | 114(53.0) | 114(100.0) | 0(0.0) |
| **Total** | **215(100.0)** | **114(53.0)** | **101(47.0)** |

**Table 2: Frequency of occurrence of intestinal helminthes in relation to age and location of study**

| Intestinal helminthes | No. (%) | Sex | | Age group (years) | | Location | |
|---|---|---|---|---|---|---|---|
| | | **Male(%)** | **Females(%)** | **5-9(%)** | **10-15(%)** | **UDPS(%)** | **ESPS(%)** |
| *Ascaris lumbricoides* | 22(33.3) | 14(63.6) | 8(36.4) | 9(40.9) | 13(59.1) | 3(13.6) | 19(86.4) |
| Hook worm | 18(27.3) | 10(55.6) | 8(44.4) | 11(61.1) | 7(38.9) | 1(5.6) | 17(94.4) |
| *Trichuris trichiura* | 26(39.4) | 13(50.0) | 13(50.0) | 8(30.8) | 18(69.2) | 2(7.7) | 24(92.3) |
| **Total** | **66(100.0)** | **37(56.1)** | **29(43.9)** | **28(42.4)** | **38(57.6)** | **6(9.1)** | **60(90.9)** |

While among the female school children, *T. trichiura* 13/26(50.0%) was most predominant, followed by hook worms [8/18(44.4%)] and *A. lumbricoides* the least [8/22(36.4%)] in terms of sex of the subjects (Table 2). It also showed that among school children aged 5-9 years, hook worms 11/18[61.1%] was the most predominant, followed by *A. lumbricoides* 9/22(40.9%) and *T. trichiura* 8/26(30.8%) was least predominant among this age group (Table 2). Also, among school children aged 10-15 years, *T. trichiura* 18/26(69.2%) occurred more frequently compared to other helminthes. This was followed by *A. lumbricoides* 13/22(59.1%) and hook worm 7/18(38.9%) was occurred less frequent among this age group. In relation to the location under study, helminthes occurred highest among the rural school; ESPS compared to the UDPS. *A. lumbricoides* 3/22(13.6%) was more frequent among samples from UDPS compared to *T. trichiura* 2/26(7.7%) and hook worm 1/18(5.6%). In the same vein, hook worm

17/18(94.4%) was more frequent among the samples from ESPS compared to *T. trichiura* 24/26(92.3%) and *A. lumbricoides* 19/22(86.4%) as shown in Table 2.

### 3.3. Distribution of intestinal helminthes in relation to sex, age and location of study

Table 3 shows the distribution of intestinal helminthes detected among school children in relation to two study locations. Of the 22/66(33.3%) *Ascaris lumbricoides* detected in this study, only 3(13.6%) male children from UDPS had *Ascaris lumbricoides* infection. Two (66.7%) of them were within age group 5-9 years and 1(33.3%) within age group 10-15 years of age. None of the female children from UDPS was infected by *Ascaris lumbricoides*. Of the 19/22(86.4%) *Ascaris lumbricoides* detected among children from ESPS, 7/19(36.8%) were from children under the age brackets 5-9 years of age and 12/19(63.2%) in age bracket 10-15 years. Also, 11/19(57.9%) of the *Ascaris lumbricoides* was detected among the male children from ESPS and 8/19(42.1%) among their female counterparts. For 26(39.4%) *Trichuris trichiura* detected in this study, 24/26(92.3%) was detected among children from ESPS and 2/26(7.7%) from UDPS. Of the 24/26(92.3%) *Trichuris trichiura* detected among school children in Emohua, 13/24(54.2%) was detected among females and 11/24(45.8%) among their male counterparts from ESPS. Also, of the 24/26(92.3%) *Trichuris trichiura* was detected among school children in ESPS, 18/24(75.0%) was from children within age brackets 10-15 years and 6/24(25.0%) from children in age bracket 5-9 years of age. However, of the 2/26(7.7%) *Trichuris trichiura* detected among school children in UDPS and this was detected only in 2/2(100.0%) male children within age bracket 5-9 years of age. In the vein, of the 18/66(27.3%) hook worms detected in this study, only 1/18(5.6%) was detected among children in UDPS and this was from 1/1(100.0%) female children within age bracket 5-9 years of age. Also, of the 18 (27.3%) hookworms, 17/18(94.4%) was detected among children in ESPS. However, 10(58.8%) out of the 17 was detected within age bracket 5-9 years and 7/17(41.2%) among children aged 10-15 years of age. Of the 17 hookworms detected among children in ESPS, 10/17(58.8%) hook worms was detected among the male children and 7/17(41.2%) among their female counterparts (Table 3).

### 3.4. Prevalence of intestinal helminthes in relation to ages of the school children

Table 4 shows the prevalence of intestinal helminthes in relation to age of the school children. It showed that school children ages 10-15 years [38/89(42.7%)] were more infected by helminthes than their counterparts in age group 5-9 years of age [28/126(22.2%)].

### 3.5. Prevalence of intestinal helminthes in relation to sex of the school children

Table 5 shows the prevalence of intestinal helminthes in relation to sex of the school children. It showed that more males [37/100(37.0%)] were infected than the females [29/115(25.2%)]. In the urban school, 51/101(51.0%) males were analyzed, of which 5/51(9.8%) were positive. Of the 63/114(54.8%) females analyzed in UDPS, only 1(1.6%) was positive for intestinal helminthes infection. In the rural school (Emohua State Primary School), 49/100(49.0%) males were examined for intestinal helminthes infection, of which 32/49(65.3%) were positive for intestinal helminthes infection. However, of the 52/115(45.2%) females examined, 28/52(53.8%) were positive for intestinal helminthes infection (Table 5).

### 3.6. Prevalence of intestinal helminthes in relation to location of study

Of the 114/215(53.0%) stool samples examined in an urban school (UDPS), 6/114(5.3%) were positive for intestinal helminthes infection while of the 101/215(47.0%) stool samples examined in rural school (ESPS), 60(59.4%) were positive for intestinal helminthes infection. Of the total number of pupils infected in the urban school, 5/89(21.8%) were in the age bracket 5–9 years of age with the highest prevalence and 1/25(4.0%) were in age bracket 11-15 years of age. Also, in the rural school, the highest prevalence occurred among ages 5-10 years of age [23/37(62.2%)] and ages 11-15 years of age [37/64(57.8%)] had a lower prevalence compared to their counterparts (Table 6).

**Table 3: Distribution of detected intestinal helminthes in relation to the two study locations**

| Intestinal helminthes | No. detected (%) | University Demonstration Primary School (UDPS), Choba (%) | | | | | Emohua State Primary School (ESPS), Emohua (%) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Males | Females | 5-9yrs | 10-15yrs | Total | Males | Females | 5-9yrs | 10-15yrs | Total |
| *Ascaris lumbricoides* | 22(33.3) | 3(100.0) | 0(0.0) | 2(66.7) | 1(33.3) | 3(13.6) | 11(57.9) | 8(42.1) | 7(36.8) | 12(63.2) | 19(86.4) |
| Hook worm | 18(27.3) | 0(0.0) | 1() | 1(100.0) | 0(0.0) | 1(5.6) | 10(58.8) | 7(41.2) | 10(58.8) | 7(41.2) | 17(94.4) |
| *Trichuris trichiura* | 26(39.4) | 2(100.0) | 0(0.0) | 2(100.0) | 0(0.0) | 2(7.7) | 11(45.8) | 13(54.2) | 6(25.0) | 18(75.0) | 24(92.3) |
| **Total** | **66(100.0)** | **5(83.3)** | **1(16.7)** | **5(83.3)** | **1(16.7)** | **6(9.1)** | **32(53.3)** | **28(46.7)** | **23(38.3)** | **37(61.7)** | **60(90.9)** |

**Table 4: Prevalence of intestinal helminthes in relation to the age of the school children**

| Age (years) | No. Tested(%) | No. Positive (%) | Males (%) | No. Positive(%) | Females (%) | No. Positive (%) | UDPS (%) | No. Positive (%) | ESPS (%) | No. Positive (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 -9 | 126(58.6) | 28(22.2) | 57(45.2) | 17(29.8) | 69(54.8) | 11(15.9) | 89(70.6) | 5(5.6) | 37(29.4) | 23(62.2) |
| 10-15 | 89(41.4) | 38(42.7) | 43(48.3) | 20(46.5) | 46(51.7) | 18(39.1) | 25(28.1) | 1(4.0) | 64(71.9) | 37(57.8) |
| **Total** | **215(100.0)** | **66(30.7)** | **100(46.5)** | **37(37.0)** | **115(53.5)** | **29(25.2)** | **114(53.0)** | **6(5.3)** | **101(47.0)** | **60(59.4)** |

**Table 5: Prevalence of intestinal helminthes in relation to the sex of the school children**

| Sex | No. Tested (%) | No. Positive (%) | 5-9 years (%) | No. Positive(%) | 10-15 years (%) | No. Positive(%) | UDPS (%) | No. Positive(%) | ESPS (%) | No. Positive(%) |
|---|---|---|---|---|---|---|---|---|---|---|
| Males | 100(46.5) | 37(37.0) | 57(51.0) | 17(29.8) | 43(43.0) | 20(46.5) | 51(51.0) | 5(9.8) | 49(49.0) | 32(65.3) |
| Females | 115(53.5) | 29(25.2) | 69(54.8) | 11(15.9) | 46(40.0) | 18(39.1) | 63(54.8) | 1(1.6) | 52(45.2) | 28(53.8) |
| **Total** | **215(100.0)** | **66(30.7)** | **126(58.6)** | **28(22.2)** | **89(26.5)** | **38(42.7)** | **114(53.0)** | **6(5.3)** | **101(47.0)** | **60(59.4)** |

**Table 6: Prevalence of intestinal helminthes in relation to location of study**

| Study location | No. Tested (%) | No. Positive (%) | Males (%) | No. Positive(%) | Females (%) | No. Positive (%) | 5-9 years (%) | No. Positive(%) | 10-15 years (%) | No. Positive(%) |
|---|---|---|---|---|---|---|---|---|---|---|
| UDPS | 114(53.0) | 6(5.3) | 51(94.5) | 5(9.8) | 63(55.3) | 1(1.6) | 89(78.1) | 5(21.8) | 25(21.9) | 1(4.0) |
| ESPS | 101(47.0) | 60(59.4) | 49(48.5) | 32(65.3) | 52(51.7) | 28(53.8) | 37(36.6) | 23(62.2) | 64(63.4) | 37(57.8) |
| **Total** | **215(100.0)** | **66(30.7)** | **100(46.5)** | **37(37.0)** | **115(53.5)** | **29(25.2)** | **126(58.6)** | **28(22.2)** | **89(26.5)** | **38(42.7)** |

## 4.0. DISCUSSION

In this study, intestinal helminthes were detected using the formol – ether concentration technique. This was used for the screening of these samples due to the following reasons: the formol – ether technique prove to be very efficient as it concentrates enough or sufficient amount of ova of *A. lumbricoides* in a sample which does not show any ova in direct smear method. It is preferred to the flotation method because it takes less time. Also in formol – ether concentration procedure, all types of worm eggs (round worms, tape worms, schistosomes and other fluke egg) larvae and protozoan cysts maybe recovered. If the number of organism in stool sample is low, examination of a direct wet mount may not detect parasite. In this study, gastro-intestinal helminthes were detected in 66 (30.7%) patients. This finding compares favorably and correlates with previous studies by Okolie et al. (2008).

Among the stool samples from 215 school children, the eggs of *Ascaris lumbricoides*, *Trichuris trichiura* and hook worm were identified in 66 stool samples. These intestinal helminthes have been reported in various parts of Nigeria (Mordi and Ngwodo, 2007; Ajero et al., 2008; Okolie et al., 2008; Tohon et al., 2008; Chukwuma et al., 2009; Awolaju and Morenikeji, 2009). This showed that most intestinal disorder was precipitated by parasitic worms. Some of these parasites especially the adult worms or eggs of *A. lumbricoides* can accidentally enter the appendix, for unknown reasons, sometimes nest in the appendicular lumen where they at times cause reactions that can result in appendicitis. The results and findings of this study are not different from the foregoing observation (Okolie et al., 2008).

Results from the study show the overall prevalence of gastro-intestinal helminthes infection and loads to be 30.7% in this area of Rivers State, Southsouthern, Nigeria. Our present finding also differs from the overall prevalences reported by other authors in previous studies in Nigeria. Contrary to our findings, some workers in Nigeria had earlier on reported higher figures. Okolie et al. (2008) reported a prevalence value of 75% among patients with appendicitis in Oguta, Imo State. Awolaju and Morenikeji (2009) reported a value of 48.4% among primary and post-primary schools children Ilesa West, Osun State and 50.80% among school children in Ilaje, Osun State. Chukwuma et al. (2009) in their study on the prevalence of parasitic geohelminth infection of primary school children in Ebenebe Town, Anambra State, reported a prevalence value of 53.6% in soil and 87.7% in stool. Chukwuma et al. (2009) also reported prevalence of geohelminth eggs/larvae in soil with respect to schools to be Umuji primary school 52.5%, Umuogbuefi primary school 83.3% and Obuno primary school 32.5% and overall prevalence in stool samples in the three schools to be 87.7% with distribution as follows; Umuji primary school, 87.5%, Umuogbuefi primary school, 97.5% and Obuno primary school, 75%. Also, studies elsewhere outside Nigeria reported higher prevalences than what was reported in our study. Jimenez-Gonzalez et al. (2009) reported a value of 34.0% among inhabitants of a rural community in Mexico. Alli et al. (2011) reported 49.4% in Ibadan, Oyo State, Nigeria.

The age groups examined in this study were between 5–12 years of age in the urban school while in the children in the rural school were between 5–15 years of age. Higher incidence of helminthes infection rate observed among the urban and rural school children could be as a result of indiscriminate and care – free habits as well as high activity involvement of this age group. This correspond to the previous findings in the related subjects (Ogbe et al., 2002). The prevalence of helminthes infection was further analyzed according to the age sex of the school children. The essence is to find out which sex among the children has the higher infection rate or if there will be any difference (Ekpo et al., 2008). In the urban school, 51 males and 63 females were tested, of which 9.8% males and 1.6% females were infected, while in the rural school, 49 males and 52 females were tested for the intestinal helminthes parasites, of which 65.3% males and 53.8% females were infected. However, no significant differences were observed in infections between male and female school children in an urban (UDPS) as well as among the rural school children (Emohua community). This trend is in accordance with the observations of various researchers (Okonko et al., 2009).

In this study, sex-related prevalence of gastro-intestinal parasitic infections was observed. Our study showed that gastro-intestinal helminthes infections were significantly higher in males than females ($p<0.05$). Males had more infections than females, similar to the observations of most authors in other endemic foci in Africa (Okonko et al., 2009). This again is related to exposure of the males to disease vectors while farming. The females are mainly involved with household chores. On the contrary, results by Chukwuma et al. (2009) reported prevalence of parasitic infection to be higher in females 91.6% than in males 83%. Awolaju and Morenikeji (2009) reported that overall infection rate was higher in females but not statistically significant among primary and post-primary schools children Ilesa West, Osun State. Nkengazong et al. (2009) also showed that differences in prevalence values of parasites between the sexes in Kotto Barombi and in Marumba II were not statistically significant. Previously, Tohon et al. (2008) in Nigeria also claimed that parasitic infections were not sex dependent. These are also contrary to our finding.

Prevalence of helminthes infection was further analyzed in relation to location of study. In this study, it was clearly observed that the urban school is of good sanitary condition; there are garbage cans around the school compound and class rooms, the playing ground was in good condition as there were no stagnant water, however, there were hand washing basins and soap in the class room as well as sufficient water supply. The urban school (UDPS) was well equipped with adequate toilets for the school population. Four male and female toilets (water close systems with lids) cleaned by a cleaner employed by the school and water is available at regular intervals for flushing toilets. Though there were food vendors in the school compound but most children brings their own food from homes with plastic warmers and water bottles, all these contributed to the low level of helminthes infections observed among the urban school children. In contrast, most of these qualities were lacking in the rural schools. It has been reported that the prevalence of intestinal helminthes infections is higher among the rural children than the urban school children due to poor socio-economic status, poor hygienic habits, lack of sanitation in these settings, enhance helminthes infections (Adeyeba and Akinlabi, 2002).

This study reconfirms that the three most common intestinal parasites were *A. lumbricoides, T. trichiura* and hook worm (Okolie et al., 2008; Okonko et al., 2009; Alli et al., 2011). This is in agreement with the finding of Odu et al. (2010) that these three species are cosmopolitan. *T. trichiura,* the most predominant helminthes in this study could be traced to the fact that moisture which is available all year round is essential for the development of embryo in the soil. This deviate from what was previously reported by others (Okolie et al., 2008; Okonko et al., 2009; Alli et al., 2011), who reported *A. lumbricoides* to be most predominant.

The 27.3% reported for hook worm in this study is higher than the 17.7% reported by Alli et al. (2011). Hook worm commonly infects the host by skin penetration. These infections observed may have been acquired by children who do not wear protective shoes which is very common among school children in rural schools (Odu et al., 2010). *Ascaris lumbricoides* the most commonly reported helminthes probably through its simple life cycle. Eggs survive better on heavy soil (clay) than on light (sandy) soil. It transmitted by faecal–oral route. The presence of *Ascaris lumbricoides* indicate that food and water taken by these school children were contaminated with effective eggs of these parasites by any of number of routes or that hand to mouth transmission may occur. Okolie et al. (2008) and Alli et al. (2011) also found *A. lumbricoides*, *Trichuris trichiura* and hookworm in stool examination done in their various studies.

*Ascaris lumbricoides* was found in 22(33.3%) stool samples that were examined. The prevalence was however, low compared with what was reported in other areas by different workers in Nigeria. Okonko et al. (2009) reported 38.8% in Abeokuta, Ogun State, Nigeria. Alli et al. (2011) reported 27.4% in Ibadan, Oyo State, Nigeria. The 33.3% prevalence value reported for *A. lumbricoides* in this study compared favourably with the prevalence value of 30.0% reported by Mordi and Ngwodo (2007). However, our value is higher than what was reported by Okolie et al. (2008) who reported a prevalence value of 14.3% for *A. lumbricoides* in Oguta, Imo State. Awolaju and Morenikeji (2009) reported a prevalence value of 39.10% *A. lumbricoides*. Chukwuma et al. (2009) reported a value of 54.1% (in stool) and 24.0% (in soil) for *Ascaris* spp. in Ebenebe Town, Anambra State. In a recent study by Jimenez-Gonzalez et al. (2009), they found no *A. lumbricoides* among inhabitant of a rural community in Mexico. The presence of helminth in the stool is of great public health concern. The high prevalence of *A. lumbricoides* reported in this study may be due to faecal pollution of the soil/environment where the patients whose stool samples were used for this study. Soil pollution is thus a major factor in the epidemiology of human ascariasis. Infection with *A. lumbricoides* could also be spread through eggs, which are swallowed as a result of ingestion of contaminated soil or contact between the mouth and the various objects carrying the adherent eggs. Contamination of food or drink by dust or handling is another source of infection (Mordi and Ngwodo, 2007).

In this study, no multiple infection of intestinal helminthes was reported. This is contrary with was reported by some authors in Nigeria. In most of the surveys in tropical Africa, it has been shown that mixed or multiple infection with intestinal nematodes is very common, such that cases of multiple infections with nematodes (Ascaris, hookworms, and Trichuris) have been reported (Mordi and Ngwodo, 2007; Okolie et al., 2008; Ajero et al., 2008; Alli et al., 2011). The presence of these helminthes in this study is a reflection of poor local level of environmental sanitation and personal hygiene. In line with the assertions of Awolaju and Morenikeji (2009), this is typical of most tropical and subtropical regions of the world where up to 15% of host population harbor approximately 70% of the worm population and serve as major source of environmental contamination. *A. lumbricoides, Trichuris trichiura* and hookworm infection occurred with a high frequency. The possible reason for this is not farfetched. It is well established that the infective stages of *A. lumbricoides*, the embryonated eggs have enormous capacity for withstanding the environmental extremes of urban environments. Furthermore, *Ascaris* eggs are coated with a mucopolysaccharide that renders them adhesive to a wide variety of environmental surfaces; this feature accounts for their adhesiveness to everything from door handles, dust, fruits and vegetables, paper money and coins.

Although, the findings of this study may have minor discrepancies with others from different countries, it still indicates that gastro-intestinal helminthes in the body system can provoke disease burden such as human ascariasis and haematuria if not treated (Mordi and Ngwodo, 2007; Okolie et al., 2008; Okonko et al., 2009). Discrepancies observed in the findings of this study and previous studies by other researchers and could be attributed to differences in place of study i.e. geographical location, and other conditions which can affect the research finding so that slight discrepancies could occur. Because the impact of parasitic infections may extend far beyond visible human disease into the spheres of chronic non-perceived unwellness or socio-economic losses and missed development opportunities and supported by the findings of this present study, and in accordance to the assertion by Jimenez-Gonzalez et al. (2009), we however recommend and consider that the health authorities should incorporate in their control programs aspects of health education, anti-protozoa drugs and control of natural water sources.

## 5.0. CONCLUSION

This study revealed that both male and female school children had the varied parasite eggs with a prevalence value of 37.0% and 25.2% respectively. This suggests that males were more exposed to parasitic infection than the females and gender may be an important epidemiological determinant for parasites loads. There is significant difference between males and females tested ($P<0.05$). This implies that the level of parasitic infection (parasite load) among school children tested may vary with regard to gender. The findings of this study have also shown that three helminthes species were prevalent among school children whose stool samples were used for this study in Port Harcourt, Rivers State, South-southern Nigeria. This information however will be very useful in the control strategy. Our study shows that a good percentage of people were infested by helminthes and re-enforces the need for an urgent effort to check the unnecessary and avoidable heavy parasites load.

The presence of three parasitic helminthes among the school children in Port Harcourt, South-southern Nigeria supports the earlier observations that parasitic infections constitute a major public health problem in the country. This observation is in accordance with the reports of previous workers who recovered different gastro-intestinal parasite species in different population. In contrast, the recovery of some of the intestinal parasites in this study indicates the level of hygienic practices exhibited by the school children since these do not require an intermediate host. Concluding from the foregoing pieces of information, it is clear that there is urgent need for de-worming i.e. reducing the worm load in the body system. In response to these high prevalences and incidences of gastro-intestinal parasites, World Health Organization (WHO) has outlined strategies to combat the problem of parasitism. In this regards, the current deworming programme by some agencies and NGOs should be cost effectiveness and use of potent but safe anti-helminthic drugs. Because of the known devastating of effect of these parasitic infections on the physical and mental condition of children, it is suggested that a control programmes against these infection commence as soon as possible such programmes should adopt the use of combined intervention. Finally, local health officials and school management should collaborate to initiate school health programmes for delivering ant-helminthes drugs and health education activities to these schools.

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