Article

Occurrence of Soil Transmitted Helminth Among Pupils of Community Primary Schools in Nkpor and Mgbodohia, Obio/Akpor Local Government Area, Rivers State, Nigeria

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Abstract: Soil transmitted helminthic infections (STHIs) are common public health concern among children in Sub saharan Africa. A study to determine the prevalence of these infections among pupils in two primary schools in Nkpor and Mgbodohia communities, Obio/Akpor Local Government Area, Rivers State, Nigeria was conducted. The formo-ether concentration technique was used to concentrate and separate the eggs and cysts from the faeces. Out of 107 pupils investigated, 81 (75.7 %) were positive for at least one helminthic infection. Although more females (54.3%) were infected than males (45.7%), there was no significant (P>0.05) difference in the prevalence of Soil transmitted helminthic infections in relation to sex. There was a significant difference (P>0.5) in infection among two major age groups (5-10years-45% and 11-15years-41.9%). Children within the age group of 16-20years had the least infection (9.9%). Out of the 81 children positive for STH, 47 (43.9 %,), 23 (21.5%), 11 (10.3%) and 5(4.7%) had *Ascaris lumbricoide*, Hookworm, *Trichirus trichiura* and mixed infection (*A.lumbricoide* + *T. trichiura*) respectively. *Ascaris lumbricoide* (43.9%) was significantly (P<0.05) higher in prevalence than other parasites. Soil transmited helminthic infections are a public health among children concern in the study area. Provision of portable water, toilet facilities and good education on the epidemiology of STHIs in addition to regular de-worming will enhance control measures.

Keywords: prevalence; soil transmitted helminth; Nkpor; Mgbodohia

1. Introduction

Soil-transmitted helminths are a group of gastrointestinal parasites that are *transmitted* to human through contaminated *soil. These parasites have their developmental stages in the soil and transform into infective stage* [1]. The eggs are passed out in faeces of infected persons into the environment, hence contaminating the soil in areas with poor sanitation especially where there are no modern toilet facilities. The infections are caused by different species of parasitic worms. These parasites are majorly nematodes and include round worm (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura*), and the species of hookworm (*Anclostoma duodenale* and *Necator americanus*) [2]. Helmithiasis (Ascariasis, trichuriasis and hookworm disease) caused by these parasites are the most prevalent in developing countries of the world possibly because of poor sanitary condition coupled with poverty and other environment factors that encourage the thriving of the parasites.

These infections constitute a global public health concern especially in sub Saharan Africa where poverty and poor sanitary condition are endemic. The World Health Organization recorded that an estimated 1.5 billion people or 24% of global population are infected with soil-transmitted helminths

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worldwide [3], out of which an estimated 300 million cases result in severe morbidity. However, the morbidity is associated with the heavy worm burdens [4]. In 2010, about 438.9 million people were infected with hookworm, 819.0 million with *A. lumbricoides* and 464.6 million with *T. trichiura* [5-7]. Ascariasis caused an estimated 2,824 deaths large percentage of which occurred in Asia [6]. In 2016, one-third of an estimated three billion people living on less than two US dollars per day developing countries of the world including Sub-Saharan Africa were at risk of at least one soil transmitted helminthic infection [8, 9].

In sub-Saharan Africa , about 866 million people were infected by STH in 2012. Hookworm, *A. lumbricoides*, and *T. trichiura* accounted for 117 million (13.6%), 117 million (13.6%), and 100.8 million (11.6%) of the total infection respectively [10]. Although the infections are reportedly prevalent in rural areas, people living in slums and scattered settles in urban and peri-urban areas are also at risk [11, 12].

School children are the most vulnerable group at risk of STH due to the habit of walking and playing barefoot, poor nutrition and poor awareness or education on the transmission pattern of the parasites[5], lack of clean water, inadequate healthcare and poor personal hygiene [13,14][5]. The infections impact heavily on the physical growth and cognitive development of infected children [15, 16]. Globally, an estimated 267 million pre-sc hool-age children and over 568 million school-age children live in endemic areas and are in need of treatment and preventive interventions [10]. These infections cause a wide range of abdominal complications, iron-deficiency anaemia and dysentery syndrome in children [17].

In Nigeria, several studies have been conducted on the prevalence of STH in different regions of the country [18-20][12] De-worming exercise is intermittently embarked upon by individuals, Non-Governmental organizations and at times Government without background data [21, 22] or baseline data upon which such program should be initiated violating the WHO's recommendation for a baseline analysis to be conducted on the prevalence of STH before initiation of control program [23].

2. Materials and Methods

2.1 Study Area

Nkpor and Mgbodohia are two communities in Obio/Akpor Local Government Area. The communities have common boundaries and share common facilities. They are clans within Rumuolumeni kingdom. The communities are host to several multinational oil companies including Agip oil company and Eni group that have several subsidiaries. The Local Government Area is basically a low land area, about 30 meters above sea level. It covers about 100sq mi (260 km^2); and due to high rain fall, the soil consists of sandy or sandy loam [24].The vegetation consist of light rain forest and thick mangrove forest. According to the 2006 Census, it has a population of 464,789 [25]. It is located between latitudes 4°45'N and 4°60'N and longitudes 6°50'E and 8°00'E. Covering around 100 sq mi, Obio-Akpor is a lowland area with an average elevation below 30 meters above sea level.

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2.2 Study Population

The study subjects were primary school pupils between the age of 5 to 16 years. The only two public primary schools in the area (Community Primary school, Mgbodohia and Community Primary School, Nkpor) were selected for the study.

2.3 Sample Collection

A total of 150 pupils were randomly selected for study and the method of [26] was adopted in the collection of faecal samples. Well labeled plastic specimen bottles containing 10% formaldehyde and wooden scapula were distributed to the participants, for collection of their faecal sample. The pupils were properly instructed on how to carefully collect their faecal samples into the specimen bottles. The samples were transported to the Research Laboratory, Department of Biology, Ignatius Ajuru University of Education for laboratory examination. Furthermore, a self structured questionnaire was used to collect demographic information on the age and sex of participants, the consistency of the stool (formed, soft, semi-soft and watery) were recorded for each subject on a recording format.

2.4 Laboratory analysis

Laboratory analysis of the samples was done using formo-ether concentration technique [27] to concentrate the parasites. About 1g of each faecal sample was thoroughly mixed in a test tube containing 4ml of 10% formol water and sieved with cotton gauze into centrifugal tube containing another 4ml of formol water. 3ml of diethyl ether was then added and thoroughly mixed. The mixture was then centrifuged for1minute at 3000rpm. The sediments were transferred onto a microscopic slide after the supernatant was discarded. Parasites eggs and cyst were observed and identified using X100 and X400 magnification of the light microscope.

2.5 Ethical Consideration

Approval for this study was obtained from the ethical committee, Faculty of Natural and Applied Sciences, Ignatius Ajuru University of Education, Port Harcourt, Nigeria. Written informed consent was also obtained from the Head teacher and Parent Teacher Association of the schools investigated.

2.6 Data Analysis

Statistical analysis of the data was done using SPSS (version 16.0). Comparative analysis involving two categorical variables was done using Chi-square test was also used to compare difference among variable at significance level of $P < 0.05$.

3. Results

Out of the 150 pupils that received specimen bottles, only 107 returned their faecal samples. Of the 107 samples collected and examined, 81 (75.7 %) were positive for at least one helminthic infection (Fig. 1.0). Of

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the 81 positive samples, 44 (54.3%) were females while 37(45.7%) were males. The results indicated that there where significant difference (P>0.5) among the two major age groups (5-10years-45% and 11-15years-41.9%). However, children within the age group of 16-20years had the least infection (9.9%) (Table 1). Out of the 81 children positive for STH, 47 had *Ascaris lumbricoide*, 23 had Hookworm, 11 had *Trichirus trichiura* while 5 had mixed infection (*A.lumbricoide* + *T. trichiura*) representing 43.9%, 21.5%, 10.3% and 4.7% of the total worm burden respectively (Table 2).

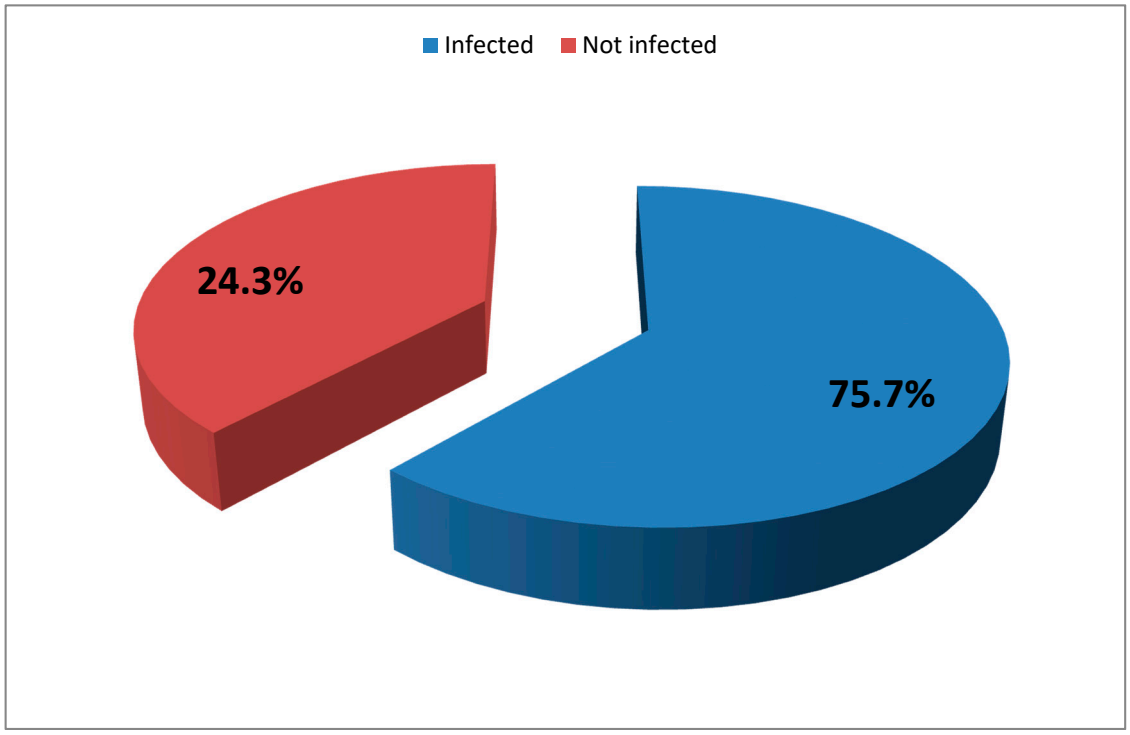

Fig. 1: Overall prevalence of Soil Transmitted Helminthic Infections in Akpor and Mgbodohia communities.

Table 1: Prevalence of Soil Transmitted Helminthes (STH) in relation to sex and age (n=107).

Variables	No. Examine	No. infected (%)
Sex		
Male	41	37 (45.7)
Female	66	44 (54.3)
Age		
5-10yrs	49	37 (45.9)
11-15yrs	44	34 (41.9)
16-20yrs	14	8 (9.9)

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Table 2: Prevalence of Soil Transmitted Helminthes (STH) in relation to species of parasite (n=107)

Parasite species	No. Examined	No. Infected (%)
A. Lumbricoide	107	47(43.9)
Hookworm	107	23(21.5)
T. trichiura	107	11(10.3)
Mixed Infection (*A. Lumbricoide* + *T. trichiura*)	107	5(4.7)

4 Discussion

The occurrence of soil transmitted helminthes among primary school children in the study area was 75.7%. This is an indication that the infections are highly prevalent in the area and of public health concern among children. Similar trend has been reported among school age children in various parts of Nigeria [28-35]. However, the high prevalence recorded in this study is higher than the 59.2% recorded by [12] among school-age children in Ife, Osun state and the 30.3% reported by [20] among school children in Amaruru community, Imo State, Southeast Nigeria. It is also higher than the is higher than the 24.6% observed by [36] among among rural Fulani children in Vom, Plateau State. The high prevalence observed in this study could be attributed to lack of toilet facilities and portable drinking water [20]. Poor socio-economic status of the parents including occupation may also be responsible for the high prevalence among these children [12,20].

The most prevalence parasite observed among the participants included *Ascaris lumbricoide* (43.9%) and Hookworm (21.5%). The prevalent rate of *A. lumbricoide* observed in this study is higher than the 13.21%, 15.0% and 18.8% recorded among children by[14] in Osun, [37] in Edo and [38] in Adamawa respectively. The parasite also occurs in all age groups investigated confirming the findings of [39, 32]. These authors recorded the prevalence of *A. lumbricoide* in all age groups investigated. The 21.5% prevalent rate observed in this study is lower than the 94.2% recorded among Primary School Children in a Amaruru Community in Imo State by[20]. It is also lower than the 33.3% recorded by [26] among abattoir worker in Port Harcourt, Rivers State. The difference in prevalence could be attributed to the period when the studies were embarked upon. [20] conducted their research in the rainy season while this study was conducted at the onset of dry season (Late November-December). The transmission of hookworm is reportedly high in rainy season [28] as the eggs are commonly distributed by the rain increasing the chance of parasite-human contact [20]. Invariably, during dry season, the transmission rate of hookworm is retarded during dry season.

The lower prevalence of *T. trichiura* recorded in this study agreed with the report of [40] and [41] among children in rural communities of Edo state and malnourished school age children in peri-urban area of Ibadan respectively. Similar lower prevalence was recorded by [12] while [20] and[42] did not observe any *T. trichiuru* in their respective studies. However, the 10.3% prevalence observed

in this study is slightly lower down the 49.9% recorded by [12]. Although more females (54.3%) were infected than males (45.7%), there was no statistically significant (P>0.05) difference in STH infection in relation to sex. This is contrary to the record of [20] who reported more infection in males than in females. No clear reason could be advanced for this trend. However, this result is an indication that both sexes are vulnerable to soil transmitted helminthic infections as they both have playing contact with soil and are exposed to the same environmental, socioeconomic and hygienic conditions.

Children in the age range of 5-10 years and 11-15 years have the highest prevalence of 45.7% and 41.9% respectively. This could be as a result of the playing habit of the children. They play in environment laden with infective helminthes eggs hence they are predisposed to infection. Again, children within the age range have poor personal hygiene and do not care to wash their hands after playing with soil. Similarly, the low prevalence observed in the age group of 16-20years could be attributed to less contact with soil as they are old enough to control their playing habit and are more conscious of their personal hygiene [20]. Similar observation has been recorded by [30,34].

Mixed infection (*A. lumbricoide* + *T. trichiura*) was recorded in 4.7% of children in the study area. This is in agreement with the reports of [12] who recorded mixed infection of *A. lumbricoide* and *T. trichiura* in 8.4% of children investigated. This is lower than the report of [43] who observed high prevalence in mixed infection of *A. lumbricoide* and *T. trichiura* among children in Ondo State.

5. Conclusions

The results of this investigation indicate significant prevalence of STHIs in the study area, hence there is need for deliberate effort in formulate of sustainable control program by the government, Non-Governmental Organizations and other agencies including the multinational companies in the area. Provision of toilet facilities, clean drinking water, orientation on personal hygiene and improved sanitary habit will enhance control measures.

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