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PREVALENCE OF HELMINTHIASIS AMONG PRIMARY SCHOOL PUPILS IN IBESIKPO ASUTAN LOCAL GOVERNMENT AREA, AKWA IBOM STATE NIGERIA

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ABSTRACT

In order to determine the incidence of helminthiasis among primary school pupils in Ibesikpo Asutan Local Government Area, 200 stool samples were randomly collected from school pupils in two primary schools in Ibesikpo Asutan from August 2014 to January 2015. The samples were collected from pupils of both sexes whose ages ranged from 5 to 15 years old. Using direct smear and floatation method to process the samples, 122 (61.0%) of the samples were found positive for various intestinal helminthes with Hookworm species accounting for 28.0%; Ascaris lumbricoides 18.5%; Trichuris trichiura 12.0% and Stronglyloides stercoralis 2.5%. The study revealed one case of mixed infection of which Hookworm and Ascaris occurred. Females recorded a slightly higher prevalence rate of 68 (63.0%) than the males 54 (58.7%). Of the two primary schools examined, St. Thomas Catholic School recorded higher prevalence rate of 70 (70.0%) than Government School Mbakekpe 52 (52.0%). The infection was detected in all the age groups examined, with the 7-8 years age group recording the highest infection rate of 50 (94.3%). Infection was also seen to decrease with increase in age in both sexes. The infection occurred most in pupils whose parents were farmers 58 (29.0%). This has shown an index of the prevailing unhygienic environment, poor personal hygiene and poverty. It is recommended that sanitary measures and deworming program should be conducted in primary schools to decrease the rate of intestinal helminth infection.


INTRODUCTION

Helminthiasis is any macroparasitic disease of humans and other animals in which a part of the body is infected with parasitic worms (Rebecca et al., 2011). There are three main classes of parasites that can cause disease in humans: protozoa, helminths and ectoparasites (Legesse and Eroko, 2004). Protozoa are microscopic, one-celled organisms that can be free-living or parasitic in nature, they are able to multiply in humans which contributes to their survival and also permits serious infections to develop from just a single organism (Munis and Ferreira, 2002). Helminths are large, multicellular organisms that are generally visible to the naked eye in their adult stages. Like protozoa, helminthes can be either free-living or parasitic in nature. In their adult form, helminthes cannot multiply in humans (Munis and Ferreira, 2002). Parasitic worms are among the most common cause of chronic infection in humans, in developing countries it is more common to be infected than not (Awasthi et al., 2008). Infection thrives and persist in communities in need of better housing, clean water, appropriate sanitation, better access to health care, education and increased personal earnings (Crompton, 2000). This is typical of most rural communities and urban slums in Nigeria. Children growing up in these communities can expect to be infected soon after weaning, and to be infected and re-infected constantly for the rest of their lives (Awasthi et al., 2008).

Infections by intestinal parasite are a major public health problem worldwide, especially among children in developing countries. World Health Organization (WHO) estimated that approximately 3.5 billion people are infected by intestinal parasites and about 450 million are ill as a result of these infections, the majority being children (WHO, 2000; Warunee et al., 2007). Helminth infections are the most common infective agents of mankind and are responsible for morbidity and mortality through out the developing world (Oyewole et al., 2002). The infection was ranked highest in morbidity rate among school aged children who are often associated with much heavy worm infections because of their vulnerability to nutritional deficiency (Bethony et al., 2006). Ova of helminthes can also be isolated from the underneath of the fingernails of these children (Dyek, 2001) and on the surface of the Nigerian currency notes which they handle and also lick (Ekejindu et al., 2005).

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These infections are a major public health concerns because factors that predispose man to the infections abound in the sub-region which includes poor environmental hygiene, poverty, malnutrition and ignorance (Ijagbone and OLAGUNJU, 2006).

In many developing countries, the only education children receive is primary school and this is the age when they are more severely infected by helminthes and may thwart the efforts of a country to provide basic school education especially in Nigeria where 70% of school-aged children are enrolled in primary schools (Ola and OYELEDUN, 2000). These infections are widespread in Africa with high prevalence rate in Nigeria, Ivory Coast, Angola, New Guinea, Rhodesia and Kenya (MUNIZ, 2008).

Intestinal heminths of importance to man are Enterobius vermicularis (pin worm), Soil Transmitted Helminths (STH): Ascaris lumbricoides (round worm), Trichuris trichiura (whip worm), Necator americanus and Ancylostoma duodenale (hookworm) and Strongyloides stercoralis (threadworm). The other intestinal nematodes (Anisakis spp, Capillaria philippinensis), trematodes and cestodes are less widespread in man. Their distribution is limited to certain areas in the world and the infections are usually confined to certain communities (YUSRI, 2007). It is estimated that 25% of the World population are infected by A. lumbricoides and this causes up to a million cases of disease annually (HOTEZ et al., 2009), 500-600 million people worldwide are infected by T. trichiura and about 500 million by hookworm (WHO, 2000).

The distribution of S. stercoralis infection usually follows that of hookworm. It is estimated that 50-100 million of the world’s population are infected by S. stercoralis (WHO, 2000). The worldwide infection by Enterobius vermicularis is about 200 million and it is the commonest in the United States (WHO, 2000). Anosike et al., (2005) recorded that in a world of 2,200 billion inhabitants, there exist over 2,000 million helminth infections with about 1.5 million Nigerians suffering from Ascariasis alone while there are several thousand with strongyloidiasis, Trichuriiasis, Enterobiasis and hookworm infections(MOTE et al., 2000; OKPALA, 2003).

There is a wide disparity in the prevalence and global distribution of intestinal helminthes (MATHYS et al., 2011). A number of epidemiological studies have indicated that individuals infected with multiple helminthes often harbor heavier infections than individuals infected with a single helminth (NGUIHIU et al., 2009). Polyparasitism may affect a considerable proportion of the population, hence posing a great toll on public health (BANKE et al., 2006; ARIBODOR et al., 2013).

Human Soil Transmitted Helminths (STH) are fecal-borne infections, and transmission occurs either directly (hand to mouth) or indirectly (through food and water). Sanitation in the context of economic development is the only definitive intervention that eliminates these infections (DINIZ et al., 2001; ALBONICO, 2006). Soil transmitted Helminths are never a public health problem where hygiene and sanitation standards are appropriate. Improvement of sanitation standards always has a repercussion on infection and re-infection levels (BURRETO et al., 2007). Hookworm eggs can develop into infective stage larvae in the soil in as little as 5 days and ascarid egg within 2 weeks, depending on the temperature and humidity (HALL et al., 2000; MONTRESSOR et al., 2002). So it is important to keep the environment clean and tidy to avoid any infection.

Helminth infections can be prevented by avoiding some very specific behaviours, including always using a toilet to urinate or defecate and washing of hands with soap and water every time after using the toilet and also before working with food or eating, keeping the finger nails short, washing of fruits and vegetable well and also cooking of food well before consumption, keeping of toilet seats and toilets clean, not polluting the soil with sewage and proper disposal of feces so that eggs do not become disseminated in the environment, also footwear should be worn to prevent the penetration of the parasite in the skin (ALBONICO, 2006; ASEMOTA et al., 2006; UWEM 2014).

World Health Organization (WHO) recommends de-worming of all school-age children at least once every year (WHO, 2006). Additionally, it is advised that de-worming should be complemented with improved access to safe drinking water and sanitation, health education and hygiene behaviour change, coupled with regular monitoring and surveillance. Drugs recommended by the World Health Organizations for use in public health interventions include Albendazole, levamisole, mebendazole, and pyrantel pamoate (MONTRESSOR et al., 2003; WHO, 2006; ILECHWUKU et al., 2009).
MATERIALS AND METHODS

Area of Study
The study was conducted in Ibesikpo Asutan Local Government Area, Akwa Ibom State, Nigeria between August 2014 and January 2015. The Local Government is made up of two clans: Ibesikpo (clan1) and Asutan (clan11) and samples were collected from one primary school in each of the clans; St. Thomas primary school, Afaha in clan1 and Government Primary School, Mbakekpe in clan11. Ibesikpo Asutan occupies the Western axis of Akwa Ibom State and lies between latitudes 4° 37’ - 5° 33’ East and longitudes 7° 25’ North (Figure 1). It lies in the tropical rainforest belts of West Africa, the area experiences two distinct seasons, the rainy seasons (April to October) and dry seasons (November to march). The inhabitants are generally homogenous; they are mostly traders, famers and civil servants. They depend on water wells, boreholes, rainwater and streams as their sources of drinking water.

Collection of Samples
Fecal samples were collected from 200 school age children between 5 and 15 years. 100 school children participated in the study from each school. Each pupil were given a wide mouth screwed cap sample bottle which labeled sex, age and name. The pupils were told to get their early morning fecal samples along with them while coming to school the next morning. The method recommended by WHO, (1991) was applied for fecal sample collection. The pupils were advised to pass the stools on a piece of clean paper first before transferring a little portion of it into the sample bottles with the aid of a clean dry stick and the bottle cap well corked. Information about their parent’s occupation was also gotten from them. The stool samples collected were analysed at the laboratory of the University of Uyo, Department of Zoology for the presence of intestinal helminthes.

Method of Examination
The samples were first examined for consistency; formed or unformed, watery or soft. There are different methods recommended by WHO, (2000) for the examination of fecal samples, these includes:
Direct smear method, floatation method and formol-ether concentration technique. For this research project, the direct smear method and floatation method were used.

Direct Smear Method
A small amount of the sample was scooped using a broom stick and mixed thoroughly with one drop of normal saline solution on a clean slide; the mixture was then spread to make a thin film. A cover slip was lowered gently to the surface of the smear on the slide and then examined with a light microscope.

Formol- Ether Concentration Technique
10% formol water was prepared by mixing 50ml of strong formaldehyde solution with 450ml of distilled water. Ethyl acetate was also used.

Procedure
2g of fecal sample was emulsified in 10ml of water in a centrifugal tube. 10ml of normal saline and 3ml of ether was added to sample, thoroughly shaken and centrifuged at 2000 revolution per minute for 2 minutes. Carefully, everything was poured off except the deposits at the bottom of the tube which was transferred to the plane slide and viewed under x10 objective of the microscope.

Floatation Method
About one gram of the sample was placed in a test tube and few drops of saturated salt solution added. It was then stirred with a glass rod to make an even emulsion, and then filtered. The filtrate was transferred into a centrifuge tube and centrifuged for 5minutes at 5000rpm. The supernatant was discarded. Saturated salt solution was added to the residue in the centrifuge tube. The centrifuge tube was filled to the brim and a cover slip lowered on it gently to avoid trapping of air bubbles. It was allowed for 15minutes after which the cover slip was lifted upward and placed on a clean slide. The slide was examined under the microscope.

DATA ANALYSIS
All data were analyzed using simple percentage.

RESULTS
Out of the 200 stool samples examined, 122 (61.0%) were positive for various intestinal helminth parasites and one case of mixed infection was observed. Hookworm infection recorded the highest prevalence of 56 (28.0%) followed by *Ascaris lumbricoides* 37 (18.5%) and *Trichuris trichiura* 24 (12.0%) while *Strongyloides stercoralis* recorded the least prevalence of 5(2.5%). Mixed infection of *Ascaris* and hookworm was 1 (0.5%). The prevalence of various intestinal helminths is shown in Table 1 and Figure 2.
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The results of the prevalence of helminthes with respect to age and sex as shown in Table 2 indicates that the females recorded a slightly higher prevalence 68 (63%) out of 108 females examined than the males 54 (58.7%) out of 92 males examined. Also the highest levels of infections were recorded among the 7 and 8 years groups in both males (94.7%) and females (94.1%) but the males also recorded high prevalence among the 5 and 6 years group (85%) while the female was among the 9 and 10 years group (71.4%). Infection also decreases with increase in age in both sexes.
Table 1: The Prevalence of Various Intestinal Helminthes

<table>
<thead>
<tr>
<th>Helminthes</th>
<th>No. Infected</th>
<th>% of Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hookworm</td>
<td>56</td>
<td>28.0%</td>
</tr>
<tr>
<td>A. lumbricoides</td>
<td>37</td>
<td>18.5%</td>
</tr>
<tr>
<td>T. trichiura</td>
<td>24</td>
<td>12.0%</td>
</tr>
<tr>
<td>S. stercoralis</td>
<td>5</td>
<td>2.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>122</strong></td>
<td><strong>61.0%</strong></td>
</tr>
</tbody>
</table>

The results in Table 3 show the prevalence of various intestinal helminthes with respect to age and sex. The result shows that hookworm was the most dominant intestinal helminthes 56 (28.0%), affecting both males and females of all age groups, the prevalence rate of helminth parasites were higher among the 7-8 years group 50 (94.3%) with hookworm having the highest prevalence rate 30 (56.6%) followed by Ascaris lumbricoides 17 (32.1%). The lowest prevalence of the different species was observed among the ≥ 13 years age groups.

Fig. 2: Pie Chart showing the prevalence of various Intestinal Helminthes

Table 2: The Prevalence with Respect to Age and Sex

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Total No Examinied</th>
<th>Male No Examined</th>
<th>No. Infected (%</th>
<th>Female No Examined</th>
<th>No. Infected (%</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-6</td>
<td>39</td>
<td>20</td>
<td>17 (85)</td>
<td>19</td>
<td>12 (63.2)</td>
</tr>
<tr>
<td>7-8</td>
<td>53</td>
<td>19</td>
<td>18 (94.7)</td>
<td>34</td>
<td>32 (94.1)</td>
</tr>
<tr>
<td>9-10</td>
<td>31</td>
<td>17</td>
<td>11 (64.7)</td>
<td>14</td>
<td>10 (71.4)</td>
</tr>
<tr>
<td>11-12</td>
<td>26</td>
<td>13</td>
<td>5 (38.5)</td>
<td>13</td>
<td>8 (61.5)</td>
</tr>
<tr>
<td>≥ 13</td>
<td>51</td>
<td>23</td>
<td>3 (13)</td>
<td>28</td>
<td>6 (21.4)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>200</strong></td>
<td><strong>92</strong></td>
<td><strong>54 (58.7)</strong></td>
<td><strong>108</strong></td>
<td><strong>68 (63)</strong></td>
</tr>
</tbody>
</table>

The prevalence of helmint eggs with respect to schools as shown in table 4 were, St. Thomas primary school 70 (70.0%) and Government School, Mbakekpe 52 (52.0%).
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Table 3: Prevalence of Various Intestinal Helminthes with Respect To Age and Sex

<table>
<thead>
<tr>
<th>Age Group</th>
<th>No. Examined</th>
<th>(%) No. Infected</th>
<th>(%) Hookworm</th>
<th>(% A. lumbricoide s)</th>
<th>(% T. trichiura)</th>
<th>(% S. stercoralis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-6</td>
<td>M-20</td>
<td>17 (85.0)</td>
<td>6 (30.0)</td>
<td>8 (40.0)</td>
<td>3 (15.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>F-19</td>
<td>12 (63.2)</td>
<td>7 (36.8)</td>
<td>3 (15.8)</td>
<td>1 (5.3)</td>
<td>1 (5.3)</td>
</tr>
<tr>
<td></td>
<td>T-39</td>
<td>29 (74.4)</td>
<td>13 (33.3)</td>
<td>11 (28.2)</td>
<td>4 (10.3)</td>
<td>1 (2.6)</td>
</tr>
<tr>
<td>7-8</td>
<td>M-19</td>
<td>18 (94.7)</td>
<td>7 (36.8)</td>
<td>11 (57.9)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>F-34</td>
<td>32 (94.1)</td>
<td>23 (67.6)</td>
<td>6 (17.6)</td>
<td>2 (5.9)</td>
<td>1 (2.9)</td>
</tr>
<tr>
<td></td>
<td>T-53</td>
<td>50 (94.3)</td>
<td>30 (56.6)</td>
<td>17 (32.1)</td>
<td>2 (3.8)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>9-10</td>
<td>M-17</td>
<td>11 (64.7)</td>
<td>1 (5.9)</td>
<td>3 (17.6)</td>
<td>6 (35.3)</td>
<td>1 (5.9)</td>
</tr>
<tr>
<td></td>
<td>F-14</td>
<td>10 (71.4)</td>
<td>4 (28.6)</td>
<td>2 (14.3)</td>
<td>3 (21.4)</td>
<td>1 (7.1)</td>
</tr>
<tr>
<td></td>
<td>T-31</td>
<td>21 (67.7)</td>
<td>5 (16.1)</td>
<td>5 (16.1)</td>
<td>9 (29.0)</td>
<td>2 (6.5)</td>
</tr>
<tr>
<td>11-12</td>
<td>M-13</td>
<td>5 (38.5)</td>
<td>1 (7.7)</td>
<td>0 (0.0)</td>
<td>3 (23.1)</td>
<td>1 (7.7)</td>
</tr>
<tr>
<td></td>
<td>F-13</td>
<td>8 (61.5)</td>
<td>2 (15.4)</td>
<td>2 (15.4)</td>
<td>4 (30.8)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>T-26</td>
<td>13 (50.0)</td>
<td>3 (11.5)</td>
<td>2 (7.7)</td>
<td>7 (26.9)</td>
<td>1 (3.8)</td>
</tr>
<tr>
<td>≥ 13</td>
<td>M-23</td>
<td>3 (13.0)</td>
<td>1 (4.3)</td>
<td>2 (8.7)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>F-28</td>
<td>6 (21.4)</td>
<td>3 (10.7)</td>
<td>1 (3.6)</td>
<td>2 (7.1)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td></td>
<td>T-51</td>
<td>9 (17.6)</td>
<td>4 (7.8)</td>
<td>3 (5.9)</td>
<td>2 (3.9)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>200</td>
<td>122 (61.0)</td>
<td>56 (28.0)</td>
<td>37 (18.5)</td>
<td>24 (12.0)</td>
</tr>
</tbody>
</table>

Key: M = Male  
F = Female  
T = Total

![Bar Chart showing Prevalence of intestinal helminth infections based on pupils’ Parents’ Occupation](chart.png)

Fig. 3: Bar Chart showing Prevalence of intestinal helminth infections based on pupils’ Parents’ Occupation
Table 4: Showing Prevalence of Intestinal Helminthes with Respect to Schools

<table>
<thead>
<tr>
<th>Schools</th>
<th>Number Examined</th>
<th>Total Examined</th>
<th>Number Infected %</th>
<th>Total Infected (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>St. Thomas</td>
<td>46</td>
<td>54</td>
<td>100</td>
<td>31</td>
</tr>
<tr>
<td>Government school</td>
<td>46</td>
<td>54</td>
<td>100</td>
<td>23</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>92</strong></td>
<td><strong>108</strong></td>
<td><strong>200</strong></td>
<td><strong>54</strong></td>
</tr>
</tbody>
</table>

DISCUSSION

The result of the study showed the occurrence of different intestinal helminthes of public health importance among primary school pupils in Ibesikpo Asutan Local Government Area. The overall prevalence of 61.0% with one or more intestinal helminths found in this study was consistent with the work done by Houmsou et al., (2009); Mordi et al., (2011); Opara et al., (2012); Usip and Nwosu (2013) and Vikram et al., (2008) and in contrast with the low prevalence rate reported by Shehu et al., (2013); Rostami et al., (2013) and Girum (2005) and the high prevalence rate obtained by Amare et al., (2007); Eze and Nze (2011) and Ezima and Ajogun (2007). The difference in prevalence could be attributed to variations in sampling techniques used, the difference in the quality of localities, exposure of pupils and treatment of infected pupils in the various areas.

Hookworm had the highest overall prevalence of 28.0%, followed by *A. lumbricoides* (18.5%) and *T. trichiura* (12.0%) while *S. stercoralis* had the least prevalence of 2.5% as shown in table 1 and as illustrated in Fig. 2. This agrees with the report of Houmsou and Amuta, (2009) and Ezeagwuna et al., (2009). A case of mixed infection was also revealed in the study of which *Ancylostoma duodenale* and *Ascaris lumbricoides* occurred and this is due to the fact that a chance of infection with one parasite can expose one to the other Ugbomoike et al., (2006). The low prevalence of mixed infection in this study is in contrast with the high prevalence recorded by Ejima and Ajogun (2007) and this can be attributed to differences in geographical distribution of the helminth parasites and sanitary behaviours of the people.

The high prevalence of hookworm (28.0%) in the study was in contrast to the low prevalence rate of 4.4% recorded by Emmy-egbe et al., (2007) and high prevalence rate of 54.6% by Ugbomoiko et al., (2006).

Hookworm infection, the highest observed in this study occurs mostly in tropical and subtropical regions of the world usually involving school children associated with poor sanitary conditions, such as lack of toilet facilities which result in the contamination of the soil with eggs and larval of the parasite to which these children are exposed. The poor fecal disposal system coupled with the fact that children in Government owned primary schools hardly wear protective shoes and those that do, remove theirs while playing within and outside the school premises which encourage the penetration of hookworm through the skin and subcutaneous tissues might have exposed them to infection.

The use of excreta as manure commonly practiced by farmers might also be acting as a source of infection since most of these children assist their parent in farm work. Also the sandy soil and rainfall observed in the study area contribute to the development of oval and larval stages of the parasite and its possible transmission to man. It is known that sandy soil allows oxygen needed for the development and movement of larvae in the soil, and rainfall provides soil moisture which aid migration of infective larvae to soil surface and penetration of the host’s skin (Houmsou et al., 2009).

The females recorded slightly higher prevalence (63.0%) than the males (58.7%) and this can be attributed to variations in the frequency of females in the study. The females also assist their parents in farm work and carry out domestic chores in the house than the males which predisposes them to these parasites (Ezeagwuna et al., 2009).

The study indicated that younger children (below 13 years) recorded higher prevalence of infection than older ones. Pupils in these age groups often spend more of their leisure time outdoors, playing and eating discarded food remains on the street.
They are also more often in contact with sand and eat indiscriminately with unwashed hands. The low prevalence observed in the ≥ 13 years age group is consistent with work done by Pukuma and Sale (2007); Shehu et al., (2013) and Ezeagwuna et al., (2009). This is because these children were always in contact with the fecal contaminated soil that served as manure on their farm when assisting their parents with farm works.

Higher prevalence of infection was recorded in St. Thomas Primary School (70.0%) than Government School, Mbakekpe as a result of poor hygienic habits such as walking barefoot, irregular washing of hands after defecation and eating of unwashed food items among these school children and seasonal changes during the study.

CONCLUSION
On the basis of these results, it can be concluded that intestinal helminth infections are important health problems among school children. Exposure to infection is influenced by climate, poverty, ignorance, lack of access to clean water, personal hygiene of these children, food preferences and contact with vectors. These infections affect the psychological and physical development of a child. Various symptoms such as malnutrition, emaciation, mental backwardness and poor growth were observed among some of these children sampled, therefore control strategies should be undertaken to reduce these infections.

REFERENCES


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