The prevalence of excreta-related soil-transmitted helminthiasis and the role of sanitation in its control in primary school children in Uyo Metropolis, Akwa-Ibom State – Nigeria

Atting, Inyang A. 1*, Ukpe, Imoh O. 2 and Usip, Lawrence P. 3

1 Department of Medical Microbiology and Parasitology, Faculty of Clinical Sciences, College of Health Sciences, University of Uyo/ University of Uyo Teaching Hospital, Uyo, Akwa Ibom State – Nigeria.
2 Department of Environmental Health Management, Center for Wetlands and Waste Management Studies, University of Uyo, Akwa Ibom State – Nigeria.
3 Department of Zoology, Faculty of Science, University of Uyo, Uyo, Akwa Ibom State – Nigeria.

Accepted 15 October, 2013

Helminthic infections recognized as being a major health priority worldwide and excreta-related soil-transmitted helminthiasis (geohelminthiasis) is a common problem in communities with poor socio-environmental conditions. This study was undertaken to determine the prevalence of geohelminthiasisin pupils (age 6 – 12 years) of public/ private schools in Uyo in Akwa Ibom State, Nigeria in relation to accessibility to potable water supply and sanitation facilities. Fresh stool samples collected from the subjects were examined using faecal floatation concentration technique and the pupils were administered a pre-tested and validated questionnaire. Of the 466 pupils randomly selected, 58 (41.1%) and 51 (43.9%) respectively were infected with geohelminthiasis in the two public primary schools sampled while 22 (20.9%) and 20 (19.2%) respectively were infected in the two private primary schools studied. This prevalence was significant (p<0.05). The predominant geohelminth found in the two public schools and one of the private schools was hookworm with the prevalence of 27 (19.1%), 37 (31.9%) and 10 (17.6%) respectively. Mixed infection with hookworm/ Ascaris lumbricoides only, Trichuris trichiura/ hookworm/ Ascaris lumbricoides only, and Trichuris trichiura/ hookworm only was generally light. Based on gender, females were more infected, 86 (56.9%) than males, 65 (43.0%). Risk factors of excreta-related geohelminthiasis observed from the study included improper disposal of faecal wastes, poor personal and household hygiene and large household size. Interestingly, accessibility to potable water supply in the study area was high, 367 (78.7%). This was higher in the two Private Schools, 94.3% and 89.4% than the two Public Schools, 73.7% and 61.2%. Morbidity due to these infections can be controlled at a reasonable cost by means of periodic chemotherapy using effective drugs. Deworming campaigns targeted at school-age children, pre-school children amongst others with proper supervision especially at the school health level is recommended.

Key words: Excreta-related, soil-transmitted, helminthiasis, geohelminthiasis, Uyo

INTRODUCTION

Human excreta and the lack of adequate personal and domestic hygiene have been implicated in the transmission of many infectious diseases including cholera, typhoid, hepatitis, polio, cryptosporidiosis, ascariasis, and schistosomiasis. The World Health
Organisation (WHO) estimates that 10% of the population of the developing world is severely infected with intestinal worms related to improper waste and excreta management (Murray and Lopez, 1996; WHO, 2000). Human excreta-transmitted diseases predominantly affect children and the poor. Most of the deaths due to diarrhoea occur in children in developing countries (WHO, 1993).

Proper excreta disposal and minimum levels of personal and domestic hygiene are essential for protecting public health. Safe excreta disposal and handling act as the primary barrier for preventing excreted pathogens from entering the environment. Once pathogens have been introduced into the environment they can be transmitted via either the mouth (e.g. through drinking contaminated water or eating contaminated vegetables/food) or the skin (as in the case of the hookworms and schistosomes), although in many cases adequate personal and domestic hygiene can reduce such transmission. Excreta and wastewater generally contain high concentrations of excreted pathogens, especially in counties where diarrhoeal diseases and intestinal parasites are particularly prevalent. Therefore for maximum health protection, it is important to treat and contain human excreta as close to the source as possible before it gets introduced into the environment (WHO, 1993).

Geohelminths; otherwise known as soil-transmitted nematode parasites are helminths whose immature stages (eggs) require a period of incubation in the soil before they become infective, preparatory to transmission. Particular examples include Ascaris, Strongyloides, Trichuris and hookworms. The soil becomes contaminated from indiscriminate defecation on the ground by people particularly children and even adults. Human infection is through secondary sources such as contaminated food, water, fruits and vegetables, direct penetration of skin or by direct ingestion of soil or through contaminated toys, as in the case of children. Although the infection by these parasites may cause low mortality and considerable morbidity among the victims, they can also affect nutritional status especially in children, producing anaemia and sometimes complications. Ascaris infestations have been associated with a normal appendix where, Ascaris lumbricoides lodges in the appendix causing intermittent pain observed sometimes in children with high worm load. This however, is rare and the presence in appendix is rarely associated with appendicitis (Wani et al., 2010).

The availability of latrines, potable water and good hygiene are important in determining the prevalence of soil transmitted nematode parasites in a given domain. This is because if these variables are absent as in the rural and urban areas of Akwa Ibom State, people will resort to defecating in the open ground, drainage and bushes around (Ebong, 2001). Faecal matter with offensive odour and unpleasant sight would litter the household surroundings. This research work was conducted to determine the health impact of excreta-related geohelminthiasis in relation to social lives of the pupils of public/private schools in Uyo, Akwa Ibom State of Nigeria.

MATERIALS AND METHODS

Study area

The study area is located in South-Eastern axis of Nigeria, flanked by Cross River, Abia and Rivers States on the sandy deltaic coastal plain of the Guinea coast. The State is bounded on the southern margin by the Atlantic Ocean and lies between the latitudes 4° 32´ and 5 °33 North and longitude 7° 25´ and 8° 25´ East. The State is characterised by three broad physical outlines, namely: the marshy river-washed soils around the riverine areas; the flat low-lying lands that constitute most of the State; and the extensive high ground with undulating hills which stand out in marked relief against the low lying lands. Akwaibom State is located within the forest zone of Nigeria and has the tropical rainy climate (Petterset al., 1991).

Sample collection and laboratory analysis

Fresh stool sample was collected from each of the Four Hundred and Sixty Six (466) consenting pupils selected randomly from classes in St. Peters Primary School, Mbiabong Anyayan, Uyo; Lutheran Primary School, Itiam Ilkot Ebia, Uyo; Jesus Saves Nursery School, Ifalkot Okpon, Uyo; and University of Uyo Staff Nursery School, Uyo. They were collected into clean screw-capped sample bottles (5 ml) to ensure that the collected samples were not contaminated with urine. The samples were analysed on the same day of collection or refrigerated for the following day analysis. The study lasted from May, 2010 to May, 2011. Only children aged 6 to 12 years who had been resident in Uyo metropolis for at least one year to the beginning of the study were recruited for examination. The stool samples were examined for geohelminths according to the method reported by Chesbrough (2004).

Ethical approval was obtained from the Akwa Ibom State Ministry of Education, Uyo - Nigeria while informed verbal and written consent was obtained from the Head Teachers and Proprietors of each of the sampled schools and the parents.

Direct wet preparations and microscopic examinations

The stool sample is completely mixed using an
with geohelminthes was 32.4%, made up of single infection in Akwa Ibom State, Nigeria. The prevalence of geohelminthes, 9.6% and the third was (p>0.05). This finding agrees with that of Atu (2006), and that of Opara et al. (2012) who worked in comparable study sites. Hookworm can directly affect nutritional status of individuals (especially children) leading to eventual growth retardation and iron deficiency anaemia. The effects of ascariasis are similar to those of hookworm in children. The lowest prevalence rate of geohelminthiasis was observed in the private school pupils. This could be attributable to the high level of maternal care and protection they receive thus reducing their risk of coming in to contact with geohelminthiasis larvae or ova.

Hookworm species are the commonest geohelminthes encountered in this study with a total prevalence rate of 17.6%, distributed as follows: 19.1% and 31.75% by each of the public schools, and 7.6% and 17.6% by each of the two private schools studied (Table 1). This finding was not statistically significant at 95% significant level (p>0.05). A. lumbricoideal was the second most prevalent geohelminthes, 9.6% and the third was T. trichiura, 1.5%. The two Public Schools had higher prevalence, 41.1% and 43.9% compared to that of the two Private Schools, 20.9% and 19.2% (Table 1).

Prevalence of geohelminthes based on gender indicated higher prevalence in females, 56.9% compared to the males, 43.0%. This was the situation in almost all the schools (Table 2). The level of sanitation based on accessibility to potable water supply and toilet facilities by pupils in the schools studied showed high access to potable water supply by the pupils, 78.7% and lower access to pit toilet, 47.4% (Table 3).

**DISCUSSION**

This research aimed to determine the prevalence of geohelminthiasis in pupils of public/private schools in Uyo in Akwa Ibom State, Nigeria in relation to accessibility to potable water supply and sanitation facilities. Soil transmitted helminthiasis is endemic in developing countries and research results indicate that the water, soil and vegetables here are heavily contaminated, and suggest a vicious circle between humans and the environment (Ulukanligil et al., 2001). In the present study, hookworm spp. had the highest overall prevalence of 17.6%, and maintained almost the highest prevalence in the different schools, both public and private. This is followed by A. lumbricoideal, 9.6% and no case of S. stercoralis was recorded throughout the study. This finding agrees with that of Atu (2006), and that of Opara et al. (2012) who worked in comparable study sites. Hookworm can directly affect nutritional status of individuals (especially children) leading to eventual growth retardation and iron deficiency anaemia. The effects of ascariasis are similar to those of hookworm in children. The lowest prevalence rate of geohelminthiasis was observed in the private school pupils. This could be attributable to the high level of maternal care and protection they receive thus reducing their risk of coming in to contact with geohelminthiasis larvae or ova.

Hookworm species are the commonest geohelminthes encountered in this study with a total prevalence rate of 17.6%, distributed as follows: 19.1% and 31.75% by each of the public schools, and 7.6% and 17.6% by each of the two private schools studied (Table 1). This finding was not statistically significant at 95% significant level (p>0.05). A. lumbricoideal was the second most prevalent geohelminthes, 9.6% and the third was T. trichiura, 1.5%. These findings are in line with what was observed by Jalo et al. (2005) working in a rural community in Northeastern Nigeria, and agrees relatively with the findings of Okoro and Ejezie (2007) working in Calabar, which is in the same geographic zone as the present study area. The
### Table 1. Prevalence of Geohelminthes in Pupils (age 6 – 12 years) in Public and Private Schools in Uyo (May, 2010 – May, 2011)

<table>
<thead>
<tr>
<th>Location of sample collection</th>
<th>No. of Pupil</th>
<th>No. (%) pupils tested positive</th>
<th>No. (%) with ASC only</th>
<th>No. (%) HKW only</th>
<th>No. (%) STGY only</th>
<th>No. (%) Tt only</th>
<th>No. (%) both ASC &amp; HKW</th>
<th>No. (%) ASC, HKW &amp; Tt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public Schools:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Peter’s Primary School, Uyo</td>
<td>141</td>
<td>58(41.1)</td>
<td>21(14.9)</td>
<td>27(19.1)</td>
<td>0</td>
<td>1(0.7)</td>
<td>5(3.5)</td>
<td>2(1.4)</td>
</tr>
<tr>
<td>Lutheran Primary School, Uyo</td>
<td>116</td>
<td>51(43.9)</td>
<td>7(6.0)</td>
<td>37(31.9)</td>
<td>0</td>
<td>2(1.7)</td>
<td>5(4.3)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Private Schools:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jesus Saves Nursery School, Uyo</td>
<td>105</td>
<td>22(20.9)</td>
<td>10(9.5)</td>
<td>8(7.6)</td>
<td>0</td>
<td>3(2.8)</td>
<td>1(0.9)</td>
<td>0</td>
</tr>
<tr>
<td>University Staff School, Uyo</td>
<td>104</td>
<td>20(19.2)</td>
<td>7(6.7)</td>
<td>10(17.6)</td>
<td>0</td>
<td>1(0.9)</td>
<td>2(1.9)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>466</td>
<td>151(32.4)</td>
<td>45(9.6)</td>
<td>82(17.6)</td>
<td>0</td>
<td>7(1.5)</td>
<td>13(2.8)</td>
<td>2(0.4)</td>
</tr>
</tbody>
</table>

ASC – *Ascaris lumbricoides*
HKW – Hookworm spp.
STGY – *Strongyloides stercoralis*
Tt – *Trichuris trichiura*

### Table 2. Prevalence of Geohelminthes based on Gender in Public and Private Primary Schools in Uyo (May, 2010 – May, 2011)

<table>
<thead>
<tr>
<th>Location of sample collection</th>
<th>No. of pupils sampled</th>
<th>No. (%) of pupils tested positive</th>
<th>Males No. (%)</th>
<th>Females No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Public Schools:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Peter’s Primary School, Uyo</td>
<td>141</td>
<td>58(41.1)</td>
<td>20(34.5)</td>
<td>38(65.5)</td>
</tr>
<tr>
<td>Lutheran Primary School, Uyo</td>
<td>116</td>
<td>51(43.9)</td>
<td>27(52.9)</td>
<td>24(47.0)</td>
</tr>
<tr>
<td><strong>Private Schools:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jesus Saves Nursery School, Uyo</td>
<td>105</td>
<td>22(20.9)</td>
<td>8(36.3)</td>
<td>14(63.6)</td>
</tr>
<tr>
<td>University Staff Nursery School, Uyo</td>
<td>104</td>
<td>20(19.2)</td>
<td>10(50.0)</td>
<td>10(50.0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>466</td>
<td>151(32.4)</td>
<td>65(43.0)</td>
<td>86(56.9)</td>
</tr>
</tbody>
</table>
prevalence of the various geohelminthic infections in this study was generally low, especially the mixed infections. Similar report of low prevalence was made by Ejezie (2007). This low prevalence could be attributable to relatively high level of sanitation based on accessibility to potable water supply and toilet facilities by the pupils in the study area. In this respect, the study revealed 78.7% of the pupils with access to potable water supply, with the two private schools’ pupils having as high as 94.3% and 89.4% accessibility. This observation is also buttressed with the finding that a fair percentage (52.6%) of the population of the pupils in both the public and private schools, and most of the pupils in the two private schools (94.3% and 89.4%, respectively) had access to flush water cistern. This was definitely the reverse in access to pit toilet by the pupils (Table 3).

This study has again confirmed that the three most endemic soil-transmitted helminthes in the southern part of Nigeria, including the Niger-Delta region, are hookworm, *A. lumbricoides* and *T. trichiura* (Mafiana, 1995; Adeyeba and Akinlabi, 2002; Obiukwu et al., 2008).

**REFERENCES**


