Soil Transmitted Helminth Infection In Okpoko, An Urban Slum

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Soil transmitted helminth infections are known to be endemic in developing countries. We investigated soil transmitted helminth infection at Okpoko community an urban slum. Fresh stool samples were collected from 808 patients randomly selected from five health facilities in the community. Stool samples were examined for presence of helminthes using the Stoll’s dilution method. Hookworm was the most common helminth identified in the community (64.4%). Other soil transmitted helminths identified were Ascaris lumbricoides (29.6%) Trichuris trichiura (2.2%), Enterobius vermicularis (1.5%), Strongyloides stearcralis (0.7%), Hymenopsis nana (0.7%) and Taenia species (0.7%). Schistosoma mansoni was not identified in this study. Multiple infection occurred in individuals with Hookworm and Ascaris the most prevalent (3.0%). The triad Ascaris, Hookworm and Trichuris trichiura accounted for 1.5% among the multiple infected population. An overall prevalence of soil transmitted helminth infection of 17.1% was observed. There was no predilection for gender with intestinal helminth infection in Okpoko community (females 9.7% vs 7.3% males). Children less than 10 years had the greatest helminth infection rate (38.5%). It is therefore imperative that sanitation and education of the populace be improved upon to reduce helminthiasis in the community.

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INTRODUCTION
Helminths are worms with many cells and are widespread throughout the world. [1] Soil transmitted helminth infections are among the most prevalent infections in developing countries. [2-4] Nematodes (roundworms), Cestodes (tapeworms) and Trematodes (flatworms) are among the most common helminths that inhabit the human gut. There are four species of Nematodes (also known as geohelminths) namely Ascaris lumbricoides (roundworms), Trichuris trichiura (whipworm), Ancyclostoma duodenale and Necator Americanus [5].

These soil transmitted helminth infections are mostly spread in developing countries through faecal-oral routes as a result of poor sewage disposal and lack of adequate water. [5] They also thrive in communities where poverty is entrenched, lack of access to healthcare and overcrowding. [4,6] The World Health Organization recommends periodic deworming of all at-risk people living in endemic areas and this includes pre-school children, those involved in subsistence farming (commonly associated with hookworm infection); those who live in poor rural areas where households lacking safe water and sanitation are clustered and those who live in warm and moist climates that are hospitable to worms and parasites. [4]

Okpoko, an urban slum, meets the WHO conditions for periodic deworming. The majority of previous studies on soil transmitted helminth infections in Nigeria centred pre-school and school children. We therefore aimed at studying soil transmitted helminth infections in Okpoko community.

MATERIALS AND METHODS
Study Area
This cross-sectional, community-based study was conducted at Okpoko, a low-income urban slum in Ogbaru Local Government Area, Anambra State, Nigeria for a two-year period (2015-2017). Okpoko has an estimated population of 670,000. The population density is estimated at 49.78 persons per hectare [7] and are inhabited by poor and middle-class families. Residential and sanitary conditions are typical of any congested urban settlement.

Five healthcare facilities were used for the study. They include two primary healthcare centres and three privately-owned clinics. These facilities have high output of patients and were randomly selected to cover the entire Okpoko community.

Study Participants
A total of 808 patients participated in the study. Age of patients ranged from one year to eighty years. These patients attended clinics and were requested to be investigated for helminthiasis.

METHODS
Fresh stool samples were collected for the study. Each patient was issued with a clean, dry, leak-proof plastic container with a wide mouth and screw cap. Their identification number was labeled on the container. Patients were duly instructed on how to collect about 10 grams of stool samples into the containers. The stool samples were examined using Stoll’s dilution technique [8] to determine presence of helminthes.

Macroscopic examination of stool samples, noting colour, consistency and constituents was first carried out.

Ethical Clearance
The ethical clearance was obtained from the Ogbaru Local Government Health and ethics committee and patients voluntarily consented to participate.

RESULTS
The soil transmitted helminths identified at Okpoko community, between 2015 and 2017 are shown in Table 1. Hookworm was the most prevalent helminth identified (64.4%). This was followed by Ascaris lumbricoides (29.6%). Other helminths identified were Trichuris trichiura (3.2%) and Enterobius vermiculans (1.5%). Taenia sp, Strongyloides stercoralis and Hymenlopsis nana each has a prevalence of 0.7%. Schistosoma mansoni was not identified in the study. Multiple intestinal helminth infections occurred in individual patients. Hookworm and ascars was the most common combination (3.0%) (Table 1).
Table 1: Soil transmitted helminthes identified at Okpoko community between 2015-2017.

<table>
<thead>
<tr>
<th>Helminth species</th>
<th>Frequency of occurrence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hookworm</td>
<td>87(64.4)</td>
</tr>
<tr>
<td>Ascaris lumbricoides</td>
<td>40(29.6)</td>
</tr>
<tr>
<td>Trichuris trichiura</td>
<td>3(2.2)</td>
</tr>
<tr>
<td>Enterobius vermicularis</td>
<td>2(1.5)</td>
</tr>
<tr>
<td>Taenia</td>
<td>1(0.7)</td>
</tr>
<tr>
<td>Strongyloides stearcoralis</td>
<td>1(0.7)</td>
</tr>
<tr>
<td>Hymenlopsis nana</td>
<td>1(0.7)</td>
</tr>
<tr>
<td>Schistosoma mansoni</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>Hookworm + Ascaris</td>
<td>4(3.0)</td>
</tr>
<tr>
<td>Hookworm + Ascaris + Trichuris trichiura</td>
<td>2(1.5)</td>
</tr>
</tbody>
</table>

Fresh stool samples were collected from a total of 808 patients comprising of 366(45.3%) males and 442(54.7%) females. Exactly 138(17.1%) patients had helminth ova detected in stool. Females 79(9.7%) were more infected than males 59(7.3%) (P>0.05). Children less than 10 years old had the highest infection rate (38.5%). Soil transmitted helminth infections was also observed among older age groups: 21.8% in 11-20 year old; 16.5% among 21-30 year old and least, 7.5% in the 41 year old as shown in table 2.

Table 2: Distribution of soil transmitted helminth infection among patients at Okpoko community.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>No studied (%)</th>
<th>No infected (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>366(45.3)</td>
<td>59(7.3)</td>
</tr>
<tr>
<td>Female</td>
<td>442(54.7)</td>
<td>79(9.7)</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10</td>
<td>117</td>
<td>15(12.8)</td>
</tr>
<tr>
<td>11-20</td>
<td>110</td>
<td>11(10.0)</td>
</tr>
<tr>
<td>21-30</td>
<td>266</td>
<td>19(7.1)</td>
</tr>
<tr>
<td>31-40</td>
<td>168</td>
<td>10(6.0)</td>
</tr>
<tr>
<td>41 and above</td>
<td>147</td>
<td>4(2.7)</td>
</tr>
<tr>
<td>Total</td>
<td>808</td>
<td>59(7.3)</td>
</tr>
</tbody>
</table>

DISCUSSION

Geohelminths (Nematodes) constituted over 90% of all soil transmitted helminths recovered from Okpoko community. Geohelminths thrive in warm and moist soils and global estimates indicate that approximately 3.5 billion people are infected with one or more of the most common of these nematode parasite.[9] In our study, the nematodes identified were Hookworm, Ascaris lumbricoides, Trichuris trichiura and Strongyloides stearcoralis. Other soil transmitted helminthes identified include Enterobius vermicularis, Taenia sp and Hymenlopsis nana. It is noted that Schistosoma mansoni was not identified in Okpoko community. In a previous study, these
helminths were confirmed in Nigeria between 2005 and 2015.\cite{2}

Hookworm was the most prevalent helminth identified in our study. This finding is similar to other studies from Southeastern Nigeria\cite{3,10-12}

It has previously been recognized that hookworm is the most common soil transmitted helminth infection and the most common Neglected Tropical Disease in sub-Saharan Africa, with the greatest number of cases occurring in Nigeria.\cite{13}

The high prevalence of Hookworm could be attributed to favourable environmental conditions such as low level environmental sanitation \cite{14} and socio-economic conditions, unhygienic nature of Okpoko community and poverty.\cite{15}

Ascariasis was the next frequently identified helminth infection in Okpoko community (29.6%). Similarly, a prevalence of 21% and 13% respectively was reported from Southwest and Southsouth regions of Nigeria.\cite{14}

In Okpoko community, indiscriminate dumping of wastes into drainages with the slightest rainfall, unhygienic practice of open defecation are the order of day. These practices encourage transmission of Ascaris infection.

*Trichuris trichiura* was also commonly found in this study (2.2%). A prevalence of (1.3%) had similarly been observed at Ezza North Local Government Area of Ebonyi State, Nigeria.\cite{16} This could be a result of poor sanitary habits of indiscriminate defecation which leads to pollution of soil with ova.

We did not observe *Schistosoma mansoni* in Okpoko community. Few studies have diagnosed helminths like *H. nana* \cite{17} and *S. mansoni*.\cite{18}

Multiple intestinal helminthiasis was observed in Okpoko community. Hookworm and ascars are the most common combinations observed (3.0%) followed by the triad hookworm, ascars and *Trichuris trichiura* (1.5%). Hookworm + ascars combination have been reported at 3.8% \cite{19} and 3.5%. \cite{3} A higher prevalence of 7% and 18% were previously observed in other parts of Nigeria respectively. \cite{10,20}

The prevalence of soil transmitted helminth infection in Okpoko community was 17.1%. This is comparable to 16.9% observed. \cite{21}

The implication is that helminthiasis is still of public health concern in Nigeria.

Sex is an epidemiological factor in assessing prevalence and intensity of parasitic diseases. We found no predilection for gender with intestinal helminth infection (females, 9.7% vs 7.3% males). This is in agreement with a study in Guyana.\cite{22}

In many previous studies, there were no clear lines of gender prevalence. While some studies had identified higher prevalence among male participants \cite{3,11,23}, some have reported females as the most infected gender.\cite{12,24-25}

Typically, children exhibit higher soil transmitted helminth intensities than any other single population.\cite{26} In Okpoko community, children less than 10 years old were found to be most infected with soil transmitted helminth infection (38.5%). This could be because of high level of soil contact activity and low personal hygiene which facilitate transmission of helminths. Our finding is consistent with the results of other workers. \cite{19,27-28} Older age groups were also infected in the community.

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Conclusion

Hookworm is the most prevalent helminth in Okpoko community. Multiple infections were also common. There was no predilection for gender with soil transmitted helminths in the community. Children less than 10 years old were the most infected. It is therefore imperative that sanitation and education of the populace should be improved on.

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