The Correlation of Nutritional Status and Prevalence of Intestinal Helminthiasis among Primary School Pupils in Wamakko Local Government, Sokoto State, Nigeria

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A cross sectional study was conducted to determine the nutritional status and prevalence of intestinal helminthiasis among primary school children in Wamakko local government, Sokoto, Nigeria. A total of 400 stool samples were collected from pupils and analyzed using formol-ether concentration technique. Information on the type of the used toilet, were obtained through questionnaire while anthropometric measurements were used to determine the nutritional status of the study subjects. Out of 400 stool samples examined, 134 (33.5%) were found be infected with intestinal helminthiasis. The most prevalent intestinal helminth was Ascaris lumbricoides (85.14%) while Hookworm and Schistosoma mansoni were the least prevalence (2.03% each). Prevalence of intestinal helminthiasis did not significantly associate with nutritional status. This study indicates that intestinal helminthiasis is a significant health problem. Therefore, mass chemotherapy, provision of potable water, provision of sanitation facilities and health education on body hygiene is highly recommended to curtail these alarming infections.

Keywords: Helminthiasis, Nutritional Status, Wamakko, Ascaris lumbricoides, Fornol-ether, Primary School, Sokoto.

INTRODUCTION

Intestinal helminthes infection is one of the most prevalent infections in human in developing countries and causes significant morbidity and mortality in endemic countries (Haque, 2007). Intestinal helminthiasis is considered the most common infection in the world with more than 2 billion people infected throughout the world. School aged children are among the most vulnerable age group to the harmful effects of chronic infections with intestinal worms (Luong, 2002).

Infection with intestinal helminthes is acquired through ingestion of infective stages from soil contaminated with human faeces (A. lumbricoides, T. trichiura) and through penetration of skin by larvae (human hookworm). Control of intestinal helminthes includes mass administration of antihelminthic ( albendazole, mebendazole, niclosamide, oxamniquine, praziquantel, pyrantel, pyantel pamoate and thiabendazole) for pre-school and school aged children living in endemic areas as well as provision of portable water, body hygiene, health education to promote body hygiene (PAHO/WHO, 2004).

In Nigeria, the most common intestinal helminthes that parasitize human are: A. lumbricoides, T. trichiura, Ancylostoma duodenale, Necator americanus, Strongyloides stercoralis, and Schistosoma mansoni (Odening, 1976). Various school based baseline surveys have been conducted in Nigeria to estimate the current status of intestinal helminthes (Opara et al., 2012, Emmy-Egbe, 2013, Simon-Oke et al., 2014, Salawu et al., 2014). This study was carried out to add to the current store of baseline data on the relationship between nutritional status and intestinal helminthiasis among the pupils in Nigeria. The prevalence of intestinal helminthiasis in the study area was also assessed.

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MATERIAL AND METHODS

The study was conducted in Wamakko Local Government of Sokoto State, Nigeria. Wamakko local government comprises of the following districts: Wamakko, Gumbi, Dundaye and Gumburawa. The major occupations of the inhabitants are farming and fishing and minor occupations such as laundry and trading. The local government was populated by Hausa people. Wamakko local government is located in the north-west geopolitical zone of Nigeria and lies between latitude 12°N and 13°58N and longitude 04°8’E and 6°65E. The local governments share boarders with Sokoto North, Sokoto South, Kware, Birji, Silame, Bodinga, Yabo and Tangaza local governments of Sokoto State (Kabiru et al., 2013).

The study population was made up of primary school pupils. Participants who were not enrolled in primary schools were excluded from the study. Ethical clearance was obtained from Wamakko local government Education Authority. An informed consent was obtained from parents/guardians of the pupils after explaining the purpose and procedure of the study. Subjects were not forced and were free to withdraw at any stage of the study. Sample size was calculated using the single proportion formula N= Zpq/d² at 95% confidence interval, P= prevalence from a previous study conducted by (Kabiru et al. 2013), where they recorded a prevalence of 38.3.

Four hundred stool samples were collected from pupils selected by random sampling. Each pupil was given a labelled clean screw capped container and guided on how to collect their stool samples. Faecal samples collected were transported to Parasitology laboratory, Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto, Nigeria for analysis.

Stool samples collected were analyzed using Formol-ether concentration technique as describe by Cheesbrough (2009). One gram (1g) of faeces was suspended in 10ml of 10% formalin and well mixed using a glass rod, the suspension was then passed through a funnel covered with gauze pad into a centrifuge tube. To the filtrate, 3ml of ether was added and mixed well by shaking gently before centrifuging for 3mins at 4000 rpm. The supernatant was decanted and the sediment examined under light microscope at 10× and 40× objectives.

Anthropometric measurements were taken as described by WHO (1995). Bathroom scale was used to measure the pupil’s weight while height was measured using tape rule. The nutritional status was based on Body Mass Index (BMI) for age (Cornier et al.,2011), where BMI = Weight (Kg)/Height (m²).

Well-structured questionnaire was administered to each pupil from whom samples were collected to obtain information such as sex, age, type of toilet etc. Questionnaires were interpreted in their local language (Hausa language) and assisted in completing them. Each questionnaire was numbered to correspond to the number labelled on pupil’s stool container.

Data obtained were analysed using Quantitative Parasitology Software version 3.0. Prevalence of intestinal helminths was calculated with the formula: (No. infected/ No. examined) ×100. Chi square test was used to test association of frequency of occurrence of intestinal helminthes with sex, type of toilet, washing hands before eating, walking barefooted and nutritional status. Bar chart and tables were drawn. P-values less than 0.05 were considered significant.

RESULTS

Out of the 400 stool samples examined for intestinal helminths, 134(33.5%) were found to be positive with various species of intestinal helmint parasites. A total of four parasites were encountered during the study, they were, in order of occurrence; *Ascaris lumbricoides* (85.14%) (photo number 1), *Strongyloides stercoralis* (10.81%) (photo number 2), *Ancylostoma duodenale* and *Necator americanus* (2.03%) (photo number 3), and *Schistosoma mansoni* (2.03%) (photo number 4) Fig 1. Although the schools are all located in the same local government (Wamakko), there is a significant difference in prevalence of intestinal helminthes among the participants from these schools (P<0.05) Table 1.

Sex specific prevalence of intestinal helminths showed that males had higher prevalence of 34.81% while females recorded prevalence of 29.91%. However, statistical analysis indicated no significant association between occurrence of intestinal helminths infection and gender, (X²=0.85: df= 1 p>0.05) Table 2. There was an increase in prevalence of helminths infection with increasing age but this decline at the 13 years and above age bracket. From table 2 below, it could be seen that pupils aged 10-12 years recorded the highest prevalence of 34.41% while pupils aged 4-6 years had the least prevalence of 31.42%. Statistically, occurrence of intestinal helminthes infection did not associate with age, (X²= 0.141: df= 5 p>0.05).

The occurrence of intestinal helminths parasites did not significantly associate with type of toilet used by the pupils. Although, the prevalence of infection was higher among pupils who use open space to defecate (33.70%) as against those who use pit latrine (33.08%) (X²=0.155: df=1 p>0.05). It could be seen from table 3 that pupils whose nutritional status is within normal range were found to be the highest infected having a prevalence of 36.00%, followed by underweight pupils with prevalence of 32.49%, while obese pupils had the least prevalence of 4.65%. However, no statistical association was observed between occurrence of the intestinal helminthes infection and nutritional status, (X²=1.20: df=2 p>0.05)
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Photo No. 1: Egg of *Ascaris lumbricoides*

Photo No. 2: Larva of *Strongyloides stercoralis*

Photo No. 3: Hookworm egg

Photo No. 4: Egg of *Schistosoma mansoni*

Figure 1: Occurrence of Intestinal Parasites among Primary School Pupils in Wamakko Local Government Area, Sokoto State.
In the present study, occurrence of intestinal helminths infection does not associate with gender. This indicate equal exposure to the source of infection for both sexes. This finding is in accordance with that of Banji et al., (2012) in Niger State and Aniwada et al., (2016) in Enugu State, who reported lack of statistical significance between occurrence of the infection and gender. However, it is at variance with the reports of Simon-Oke et al., (2014) in Ondo State which showed association of infection with sexes, though females recorded higher infection rate than males. The lack of significant association of intestinal helminth infection with age group indicates that regardless of age pupils are equally exposed to unhygienic related activities that exposed them to the source of infection such as playing on faecally polluted soils, defecating indiscriminately in an open places, eating with hand not washed. This contradicts other findings such as that of Babatunde et al., (2013) in Kwara State and Simon-Oke et al., (2014) in Ondo State and Chinenye et al., (2018) in Rivers State who reported that prevalence of infection among pupils increases with age, as they often spend their time outdoors playing on garbage dumps and foraging for wild berries, other fruits vegetables and discarded food remains on the street.

Babatunde et al., (2013) in Kwara State and Chinenye et al., (2018) in Rivers State, reported that intestinal helminths infection to be significantly associated with the use of opened field. However, in the present study there

\[ X^2 = 0.121; P<0.05 \]

\[ X^2=0.85; df= 1 p>0.05 \]

\[ X^2=1.20; df=2 p>0.05 \]

**DISCUSSION**

The prevalence of 33.5% for intestinal helminths recorded in this study could be attributed to exposure of pupils to predisposing factors to parasitic infections; poor personal hygiene, sanitary conditions, lack of toilet facilities or where present they were not functional or no adequate water supply. This prevalence is higher than 27.4% reported by Emmy-Egbe (2013) among school children in Ihiala Local Government of Anambra State, 25.6% by Aniwada et al., (2016), 27.1% by Chinanye et al., (2018). However, this prevalence is lower than previous reports in other parts of the country such as 64.8% reported by Agbolade et al.,(2004) in urban centre and some rural communities in South West, Nigeria, 67.4% by Opara et al., (2012) in Akwa Ibom State, 62.2% by Salawu et al., (2014).

Ascaris lumbricoides, Strongyloides stercoralis, Ancylostoma duodenale, Necator americanus and Schistosoma mansoni were the most prevalent intestinal helminths encountered during the study. The relative higher frequency of Ascaris lumbricoides recorded in this study might be attributed to the biotic potential of the worm and the ability of the eggs to withstand adverse conditions in the soil. This agrees with the report of Banji et al., (2012) in Agaie, Niger State of Nigeria, where they reported Ascaris lumbricoides to the most significantly prevalent parasites having prevalence of 13.8%.

Occurrence of intestinal helminths infection seems to association with schools. Gidan Bubu primary school was significantly more infected than other schools. This could be attributed to the lack of toilet facilities in the school and pupils in this school are more unhygienic than pupils of other schools examined. This correspond with the findings of Emmy-Egbe (2013) in Anambra State who reported significant association between occurrence of helminthic infection and schools.

In the present study, occurrence of intestinal helminths infection does not associate with gender. This indicate equal exposure to the source of infection for both sexes. This finding is in accordance with that of Banji et al., (2012) in Niger State and Aniwada et al., (2016) in Enugu State, who reported lack of statistical significance between occurrence of the infection and gender. However, it is at variance with the reports of Simon-Oke et al., (2014) in Ondo State which showed association of infection with sexes, though females recorded higher infection rate than males. The lack of significant association of intestinal helminth infection with age group indicates that regardless of age pupils are equally exposed to unhygienic related activities that exposed them to the source of infection such as playing on faecally polluted soils, defecating indiscriminately in an open places, eating with hand not washed. This contradicts other findings such as that of Babatunde et al., (2013) in Kwara State and Simon-Oke et al., (2014) in Ondo State and Chinenye et al., (2018) in Rivers State who reported that prevalence of infection among pupils increases with age, as they often spend their time outdoors playing on garbage dumps and foraging for wild berries, other fruits vegetables and discarded food remains on the street.

Babatunde et al., (2013) in Kwara State and Chinenye et al., (2018) in Rivers State, reported that intestinal helminths infection to be significantly associated with the use of opened field. However, in the present study there

### Table 1: School Specific Prevalence of Intestinal Helminths among Primary School Pupils in Wamakko Local Government Area, Sokoto.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>No. Examined</th>
<th>No. Infected</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wajeke</td>
<td>100</td>
<td>23</td>
<td>23.00</td>
</tr>
<tr>
<td>Tangwale</td>
<td>100</td>
<td>36</td>
<td>36.00</td>
</tr>
<tr>
<td>Kaura Kimba</td>
<td>100</td>
<td>31</td>
<td>31.00</td>
</tr>
<tr>
<td>Gidan Bubu</td>
<td>100</td>
<td>44</td>
<td>44.00</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>134</td>
<td>33.5</td>
</tr>
</tbody>
</table>

\[ X^2=0.121; P<0.05 \]

### Table 2: Sex and Age Specific Prevalence of Intestinal Helminths among Primary School Pupils in Wamakko Local Government Area, Sokoto.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>No. Examined</th>
<th>No. Infected</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>293</td>
<td>102</td>
<td>34.81</td>
</tr>
<tr>
<td>Females</td>
<td>107</td>
<td>32</td>
<td>39.90</td>
</tr>
<tr>
<td>Age (Years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-6 years</td>
<td>35</td>
<td>11</td>
<td>31.43</td>
</tr>
<tr>
<td>7-9 years</td>
<td>150</td>
<td>61</td>
<td>40.67</td>
</tr>
<tr>
<td>10-12 years</td>
<td>154</td>
<td>82</td>
<td>53.25</td>
</tr>
<tr>
<td>13 years &amp; above</td>
<td>61</td>
<td>27</td>
<td>44.26</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>134</td>
<td>33.5</td>
</tr>
</tbody>
</table>

\[ X^2=0.85; df=1 p>0.05 \]

### Table 3: Prevalence of Intestinal Helminths among Primary School Pupils in Relation to Type of Toilet and Nutritional status

<table>
<thead>
<tr>
<th>Parameters</th>
<th>No. Examined</th>
<th>No. Infected</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Toilet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open space</td>
<td>270</td>
<td>91</td>
<td>33.70</td>
</tr>
<tr>
<td>Pit latrine</td>
<td>130</td>
<td>43</td>
<td>33.07</td>
</tr>
<tr>
<td>Nutritional Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>75</td>
<td>27</td>
<td>36.00</td>
</tr>
<tr>
<td>Obese</td>
<td>86</td>
<td>4</td>
<td>4.65</td>
</tr>
<tr>
<td>Underweight</td>
<td>317</td>
<td>103</td>
<td>32.49</td>
</tr>
<tr>
<td>Total</td>
<td>400</td>
<td>134</td>
<td>33.50</td>
</tr>
</tbody>
</table>

\[ X^2=1.20; df=2 p>0.05 \]
was lack of significant association between occurrence of intestinal helminths infection with type of toilet. All pupils are equally exposed to the infective places regardless of the type of toilet they use. However, occurrence of intestinal helminth infection does not associate with nutritional status of the pupils. This might be due to the fact that virtually all pupils infected had light helminthic infection that less likely affect their weight and height; hence the likely explanation for the lack of significant association. This is in conformity with the findings of Ilechukwu et al., (2014) in Enugu, South eastern Nigeria and Adeniran et al., (2017) in Abeokuta, Southwest Nigeria, who suggested the acquisition of intestinal helminths is not associated with the reduction in growth/anthropometric status of the children in Enugu and Abeokuta.

CONCLUSION AND RECOMMENDATION

The prevalence of intestinal helminth infection among primary school pupils in Wamakko local government is high. This could be related to poor personal hygiene, poor sanitary condition and lack of toilet facilities. Therefore, multiple strategy which involves provision of health education to the communities, mass deworming of school age children, provision of toilet facilities, and mass chemotherapy with antiparasitic drugs, of all school aged children in the study area is highly recommended.

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