Prevalence and Intensity of Intestinal Helminth Infections and Associated Risk Factors among School-Aged Children in Abua/Odual Local Government Area, Rivers State

Abstract
A study was carried out to determine the prevalence and intensity of intestinal parasite infections and its associated risk factors among school-aged children in Abua/Odual Local Government Area, Rivers State between May-August 2015. Standard parasitological procedures as recommended by World Health Organization were employed in sample collection and examination. Out of a total of 434 stool samples examined, 306 (70.51%) were infected with a mean intensity of 571.38±131.25 epg. The males showed a higher prevalence of intestinal parasite infections (72.03%) than the females (68.69). However, this is not statistically significant (p>0.05). Age distribution of the prevalence of infection did not show a definite pattern but infection rate was highest among the students aged 5-8 years (75.19%) and least among the students aged 13 years and above (60.5%) with a mean intensity of 340 ± 160.96 epg. This observed difference in prevalence by age was not statistically significant (p>0.05). T. trichiura was the most prevalent parasite amongst the student (52.30%) while A. lumbricoides showed the least prevalence (19.81%). Occupational prevalence showed that children whose parents were motorcyclist rider had highest infection rate (79.4%) while children whose parents were civil servants showed least prevalence (47.1%) and intensity 453.51±137.41 epg. Study also revealed that students who defecate in nearby bushes and backyards had the highest prevalence (79.83%) followed by those that use pit latrine. The present investigation has shown that intestinal helminthiasis remains a public health problem in Nigeria. Regular environmental sanitation and health education to encourage school-aged children to adopt behavioral change is advocated.

Key words: Prevalence, intensity, school-aged children, helminthes

Background
Helminths are parasitic worm-like organisms that live and depend for their nutritional nourishment and protection on living hosts, and in the process disrupt their host’s nutrient absorption, causing listlessness and diseases. The global burden caused by soil transmitted helminthiasis is estimated at 39 million disability-adjusted life years (DALYs) (WHO, 2002; Hotez et al., 2006). Parasitic infections are the major public health problem in Sub-Saharan Africa. Globally, about 1.5 billion people, mostly from developing countries are affected with helminths (WHO, 2015). Intestinal parasitic infections are among the most prevalent human infection worldwide (Ilechukwu et al., 2014), and at highest risk of morbidity are children and pregnant women, with chronic infection reported in at least 400 million worldwide. The prevalence of helminthiasis is associated with poverty and poor sanitary conditions, and about one-third of the world’s population has helminth infection especially rural dwellers (WHO, 2015). Helminthiasis occurs mostly in developing countries, particularly where sanitation is poor (CDC, 2014; Jurillo et al., 2014; Jimenez-Cisneros and Maya-Rendon, 2007). However, prevalence of parasitic infections varies from one country to another. There are many reasons for the difference in prevalence of infections in these countries such as geographic and socioeconomic factors, climate, poverty, malnutrition, population density and limited access to clean water and overcrowding. The socio-cultural and agricultural practices of the people also
combine with such factors as ecosystem degradation in creating conditions favorable for the high transmission and sustenance of many human diseases especially parasitic diseases (Manganelli et al., 2012 para 2012). School – age children are one of the groups at high risk for intestinal parasitic infections and the adverse effects are alarming. Intestinal parasitic infections have detrimental effects on the growth and physical fitness (Nematian et al., 2008) and cognitive performance of school age children (WHO, 2006)

MATERIALS AND METHODS

Study Area

The study area is Odual clan in Abua/Odual Local Government Area in Rivers State. The Local Government is located geographically between Latitudes 4.5 and 6.0 degrees north of the equator and Longitude 6.0 and 7.0 degrees east of the Greenwich Meridian and a population of 282,410 (Nation Bureau of Statistic, 2010). The inhabitants of these clan live in clustered homesteads of mainly brick houses and few mud houses, reinforced with bamboo sticks. Roads in the clan are under deplorable condition and only permit free movement during the dry seasons. Ponds, well water, streams, rivers and recently installed borehole pumps in the communities are sources of water for both economic and domestic uses. Both communities lack toilet facilities, as bushes are used for toilet purpose. Also there is absence of a standard market, and hospital in the communities.

Study Design

The study was a cross-sectional descriptive study in which stool samples were collected from school-aged children in selected communities for parasitological analysis. Inclusion criteria were: children resident in the selected communities for at least 6 months, children with no history of deworming for the past four months prior to the study. Children whose parents or guardians failed to give informed consent or did not meet these inclusion criteria were excluded.

Specimen Collection

Informed consent was obtained from heads of the primary and secondary schools in the area, parents and students. The school aged children were selected through simple random sampling technique and plastic containers were given to each child for collection of fecal sample. Each sample was first examined for its consistency, colour and presence of blood, mucous and proglottides of tapeworms, with the aid of an applicator stick. Further examination was by the use of direct and Stoll’s technique for counting helminth eggs (Cheesbrough, 2005). Eggs were recognized by their outstanding characteristics. The number of eggs per gram of faeces was also calculated. Questionnaires aimed at obtaining personal data, information on habits, parent’s occupation and health risk factors within the community were answered by their parents/guardians.

Data Analysis. Data on stool specimens were stratified according to age and sex and was analysed using standard statistical tests, including Chi-squared tests. Values were considered statistically significant at $p<0.05$

Ethical consideration
The study protocol was approved by the Research and Ethical Committee of the University of Port Harcourt. Permission of the traditional village head of each community and authorities of selected schools were also obtained. Informed written consent was obtained from the parents/caregivers of each child investigated, before the subjects were enrolled in the study.

RESULTS

A total of 434 stool samples were collected and examined for gastrointestinal helminth parasite in the Abua/Odual Local Government Area, Rivers State. Of which 306 (70.5%) were infected, with an intensity (Mean±SD) of 571.38±131.25. Table 1 indicated that males showed a higher prevalence of intestinal parasite infections 170 (72.03%) than the females 136 (68.69%). However, this is not statistically significant (p>0.05). Although the prevalence of these helminths was more in males, the intensity of infection was more in females than in males, with a mean intensity of 655±268.97 (epg) compared to 492.81±78.97 (epg) of males. A total of three parasitic infections were encountered. These parasites include *Ascaris lumbricoides*, *T. trichiura*, and hookworm. Data revealed that infection with *T. trichiura* had the highest prevalence and intensity of infection, 52.30%, 447.14±106.91. Hookworm had 31.56% while *A. lumbricoides* had 19.81% with intensities of 264.96±52.13 and 420.93±183.43 respectively (Table 2). The prevalence and intensity of helminthic infection among the studied population based on age showed that the highest prevalence and intensity of infection were found in age group 5-8 years with a prevalence of 75.19% and an intensity of 751.06±376.23, while the least prevalence and intensity of infection were found in ≥13 years (62.5%, 340±160.96). There was no significant association between age and helminthiasis (χ²= 4.271, df=3, p=0.234) (Table 3). Comparing the distribution of parasites within the age grouping, *A. lumbricoides* was most encountered among the age bracket of 5-8 years while *Trichuris trichiura* was frequent among subjects aged 9-12 years in relation to the prevalence of the other parasites within each age groupings (Figure 1). Distribution of intestinal parasite infections based on their toilet system showed that students who use bush/ground toilet system recorded the highest level of prevalence and intensity of infection 79.8% and 651.28±204.62, followed by those that use pit/latrine with a prevalence of 72.1% and an intensity of 603.81±187.91 while the students that use water closet toilet system recorded the least prevalence and intensity 9% and 385.70±278.99 respectively. Occupational prevalence showed that infection rate was highest among children whose parents were motorcyclists 79.4% with an intensity of 527.08±197.11; while those whose parents were civil servants had the least prevalence and intensity, 47.1% and 472.72±213.10 (Table 4). The finding of this study in figure 2 revealed that helminth infections were most prevalent among 9-12 years who used using pit/latrine toilet. Of the Eighty-six children who used pit/latrine toilet 62 (72.09%) were infected by the various helminthes while 190 (79.83%) who used bush/ground toilet system where infected with children 5-8 years having the highest prevalence of 85.23%. However, age group 5-8 years had the highest prevalence among the school children who used water closet (66.67%) while those who used jetty toilet had an overall prevalence of 48.39% with the age group 9-12 having the highest prevalence.
### Table 1: Overall prevalence and intensity of gastrointestinal parasite infection by age

<table>
<thead>
<tr>
<th>Sex</th>
<th>No. examined</th>
<th>Infected (%)</th>
<th>Non-infected (%)</th>
<th>Intensity (95% CI)</th>
<th>$\chi^2$</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>236</td>
<td>170 (72.03)</td>
<td>66 (27.97)</td>
<td>492.81 ± 78.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>198</td>
<td>136 (68.69)</td>
<td>62 (31.31)</td>
<td>655 ± 268.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>434</td>
<td>306 (70.51)</td>
<td>128 (29.49)</td>
<td>571.38 ± 131.25</td>
<td>0.580</td>
<td>0.446</td>
</tr>
</tbody>
</table>

### Table 2: Types and occurrence of parasitic infections amongst the school-aged students

<table>
<thead>
<tr>
<th>Parasites</th>
<th>No. examined</th>
<th>No. infected</th>
<th>Prevalence (%)</th>
<th>Intensities (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. lumbricoides</em></td>
<td>434</td>
<td>86 (19.81)</td>
<td>19.81</td>
<td>420.93 ± 183.43</td>
</tr>
<tr>
<td><em>T. trichiura</em></td>
<td>434</td>
<td>227 (52.30)</td>
<td>52.30</td>
<td>447.14 ± 106.91</td>
</tr>
<tr>
<td>Hookworms</td>
<td>434</td>
<td>137 (31.56)</td>
<td>31.56</td>
<td>264.96 ± 52.13</td>
</tr>
</tbody>
</table>

### Table 3: Intensity of gastrointestinal parasite infection by age

<table>
<thead>
<tr>
<th>Ages</th>
<th>No. examined</th>
<th>Infected</th>
<th>Intensity (95% CI)</th>
<th>$\chi^2$</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4 years</td>
<td>184</td>
<td>132 (71.74)</td>
<td>492.37 ± 117.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-8 years</td>
<td>129</td>
<td>97 (75.19)</td>
<td>751.06 ± 376.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-12 years</td>
<td>89</td>
<td>57 (64.04)</td>
<td>526.67 ± 151.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥13 years</td>
<td>32</td>
<td>20 (62.5)</td>
<td>340 ± 160.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>434</td>
<td>306</td>
<td>2110.1 ± 201.70</td>
<td>4.271</td>
<td>0.234</td>
</tr>
</tbody>
</table>
Figure 1: Age distribution and types of gastrointestinal infection among the school children.

Table 4. Prevalence and intensity of gastrointestinal infections by epidemiological factors

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Total samples</th>
<th>No. Infected(%)</th>
<th>Intensities(95% CI)</th>
<th>χ²</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Toilet types</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Pit/latrine</td>
<td>86</td>
<td>62(72.1)</td>
<td>603.81±187.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bush/ground</td>
<td>238</td>
<td>190(79.8)</td>
<td>651.28±204.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water closet</td>
<td>17</td>
<td>9(52.9)</td>
<td>385.70±278.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jetty</td>
<td>93</td>
<td>45(48.4)</td>
<td>469.33±134.82</td>
<td>34.401</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmers</td>
<td>287</td>
<td>208(72.5)</td>
<td>625.19±207.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcyclists</td>
<td>34</td>
<td>27(79.4)</td>
<td>527.08±197.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civil servants</td>
<td>51</td>
<td>24(47.1)</td>
<td>472.72±213.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>shop owners</td>
<td>62</td>
<td>47(75.8)</td>
<td>485.11±187.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>434</td>
<td>306</td>
<td>2110.10±201.70</td>
<td>16.152</td>
<td>0.001</td>
</tr>
</tbody>
</table>
Discussion

This study showed a high prevalence (70.51%) of gastrointestinal parasite infection. This could be due to lack of environmental sanitation, potable water and health education in the studied area. It could also be attributed to lack of deworming programme in the area. This observation disagrees with the previous studies on prevalence of intestinal parasites in Southwest Nigeria (Hannah et al., 2013, Lorina. 2013, Ihesiulor et al., 2013) who reported a prevalence of 64.6%, 45.5% and 22.8% respectively among children. The difference in prevalence between these study areas and the current research area could be due to the difference in the study population, geographical area of study, the type of settlements, level of sanitary infrastructure, variation in environmental factors like level of sanitation and level of education as well as presence of school health services. Babatunde et al., (2013) reported that rapid and even modern socio-economic development led to improved hygiene, better feeding and rapid fall in intestinal parasitism. Unfortunately this seemed to be absent in the current study area. Results and other works done by Foghi et al., 2014, Odu et al., 2010, showed that parasites particularly *Trichuris trichiura*, hookworm, *Ascaris lumbricoides* are common in Nigeria. The high intensity recorded for *T. trichiura* and hookworm is a reflection of worm burden and also it is an indication that the children haboured large number of female worms that only pass eggs. Furthermore, it could also indicate a habit of poor wearing of shoes by the pupils. The high intensity of *T. trichiura* and hookworms in this study is a confirmation of the fact that children were highly vulnerable to parasitic infection. This study found that the overall prevalence of intestinal parasite infection was highest between the age’s 5-8years, even though the observed difference in prevalence by age was not statistically significant. Age associated helminth intensity varied greatly across the age groups. This is in confirmation with the findings of Foghi et al., 2014 who also observed in
their investigation that age group 5-7 years had higher prevalence. This could be because children
in this age group are very active domestically, working in fecally contaminated farms and
fetching water from contaminated rivers and streams. This observation is in accordance with the
report by Eze and Nzeako, 2011; and Nwaneri and Omuemu, 2012, who revealed that children
above the age of 13 usually expressed low worm burden. This work also showed that the males
had a higher prevalence of intestinal parasite infection than the females. Prevalence is not
dependent on sex among the sampled population which agrees with the work of Ihesiulor et al.,
(2013). This result could not have been otherwise in view of the observation that most of the
pupils walk around the community barefooted. Some males that are infected were because they
played football barefooted on grounds that have been littered with faeces and most like the
females counterpart walk to school barefooted. Even in the course of playing, most are bare-
bodied thereby exposure of their bodies to infection especially to geohelminths
like *T. trichiura* and hookworms. They also assist their parents in the farm; by this, males are at a
higher risk of infection. Again, the habit of eating food with unwashed hands and unwashed
fruits also plays a role in transmission of *Ascaris lumbricoides*. Occupational prevalence showed
that children whose parents were civil servants had lower prevalence and intensities. This could
have been because their parents could afford to deworm them and some of the parents had
knowledge of prevention, control and treatment of helminthiasis. Study also revealed that
students who defecate in nearby bushes and backyards had the highest prevalence (79.83%).
Concerns about the unhygienic behaviours of people defecating in open fields, improper disposal
and management of sanitary wastes and lack of toilets in homes and public places had been made
known by Lorna et al., (2007). These findings showed that despite the years of mass treatment of
infected persons in schools, the infection in Nigeria has persisted. It is not surprising as children
usually play around backyards and nearby bushes. Most backyards serve as toilet ground for
children who have no watercloset at home or jetty toilets in their communities. During the rainy
season, polluted water from these backyards flood playgrounds causing infections to susceptible
children. Moreover, most children do not properly cover their faeces with earth exposing their
possibly infectious faeces to passers-by. Domestic fowls also play a role in the distribution of
parasites in their endless search for food, unearthing covered faeces with their claws as they
scratch the ground surface.

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