Original Research Article

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%). 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. The 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 behavioural change are advocated.

Keywords: Prevalence, intensity, school-aged children, helminthes

Background

Helminths are parasitic worm-like organisms which live and depends on 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) with a prevalence ranging from 27.66% (lorina, 2013) to 45.5% (Abah and Arene, 2015); 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, mainly where sanitation is poor (CDC, 2014; Jurillo *et al*., 2014; Jimenez-Cisneros and Maya-Rendon, 2007). Parasitic infections, undernutrition, and iron deficiency anaemia (IDA) are common problems in developing countries, and they are mainly due to poverty which contributes to food insecurity, unclean surroundings, and limited access to health care (WHO 2002).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 favourable 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 parasitic intestinal 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). Parasitic intestinal infections are more prevalent in school-aged children and cause a wide range of complications, including bowel obstruction, anorexia, anaemia, diarrhoea, and malabsorption (Stephenson *et al*.,2000). Therefore, this study aims to assess the current prevalence of gastrointestinal helminths in the school-aged children in the studied area.

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. Most communities in Odual clan lack toilet facilities, as bushes and riverbanks 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 SPSS version 22. The Chi-square test was used to evaluate apparent differences for significance. Values were considered statistically significant at $p<0.05$

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 identified. 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 (χ^2= 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 5-8years while *Trichuris trichiura* was frequent among subjects aged 9-12years 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. Infection rate was highest among children whose parents were motorcyclist's riders 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). Helminth infections were most prevalent among 9-12years who used pit/latrine toilet (Fig.2) while 5-8years were infected with a prevalence of 85.23% among those who used bush/ground toilet system and water closet (66.67%). Those who used jetty toilet had an overall prevalence of 48.39% with 9-12 years having the highest prevalence.

Table 1: Overall prevalence and intensity of gastrointestinal parasite infection by gender

Sex	No. examined	Infected (%)	Non-infected (%)	Intensity(95% CI)	χ^2	*P*
Males	236	170(72.03)	66(27.97)	492.81±78.97		
Females	198	136(68.69)	62(31.31)	655±268.97		
Total	434	306(70.51)	128(29.49)	571.38±131.25	0.580	0.446

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

Parasites	No. examined	No. infected (%)	Prevalence (%)	Intensities(95% CI)
A. lumbricoides	434	86 (19.81)	19.81	420.93±183.43
T. trichiura	434	227(52.30)	52.30	447.14±106.91
Hookworms	434	137(31.56)	31.56	264.96±52.13

Table 3: Intensity of gastrointestinal parasite infection by age

Ages	No. examined	**Infected**	Intensity(95%CI)	χ^2	***P*-value**
1-4years	184	132(71.74)	492.37±117.86		
5-8years	129	97(75.19)	751.06±376.23		
9-12years	89	57(64.04)	526.67±151.78		
≥13years	32	20(62.5)	340±160.96		
Total	434	306	2110.1±201.70	4.271	0.234

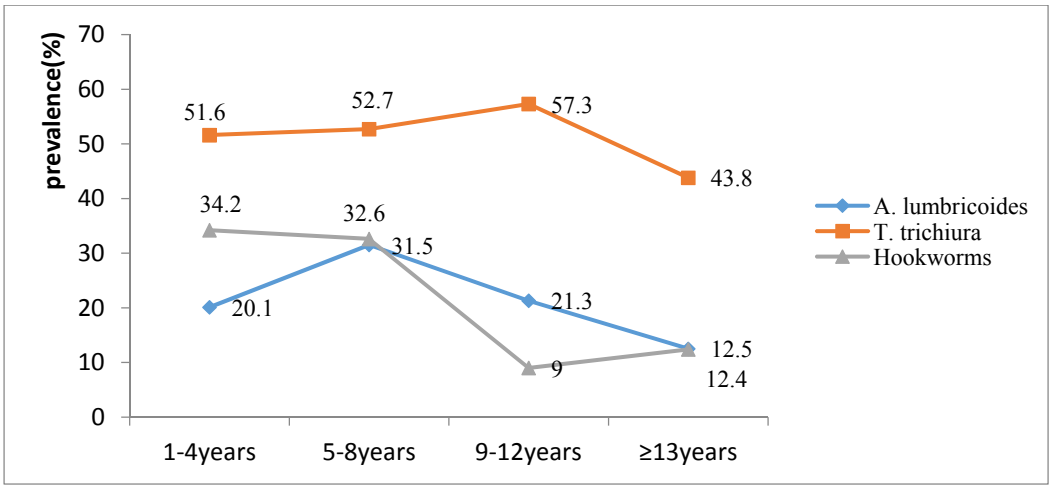

Figure 1: Age distribution and types of gastrointestinal infection among the school children.

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

Risk factors	Total samples	No. Infected(%)	Intensities(95% CI)	χ^2	*P*-value
Toilet types					
Pit/latrine	86	62(72.1)	603.81±187.91		
Bush/ground	238	190(79.8)	651.28±204.62		
Water closet	17	9(52.9)	385.70±278.99		
Jetty	93	45(48.4)	469.33±134.82	**34.401**	**0.000**
Occupation					
Farmers	287	208(72.5)	625.19±207.91		
Motorcyclists	34	27(79.4)	527.08±197.11		
Civil servants	51	24(47.1)	472.72±213.10		
shop owners	62	47(75.8)	485.11±187.41		
Total	434	306	2110.10±201.70	**16.152**	**0.001**

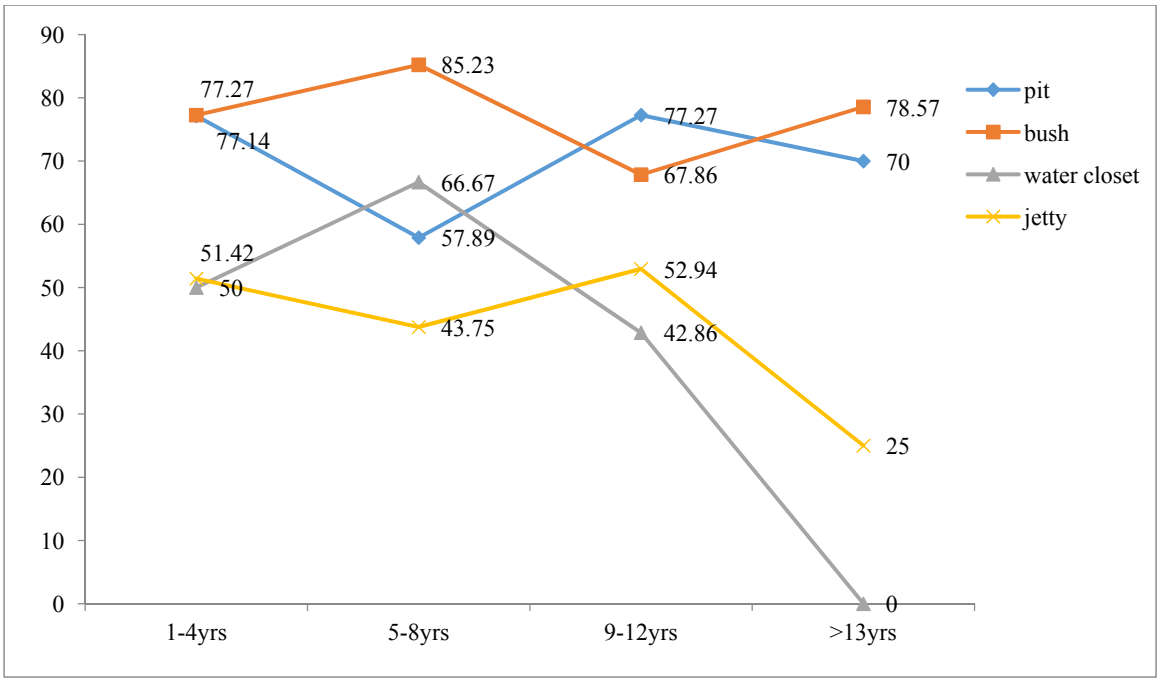

Figure 2: Distribution of gastrointestinal infections based on toilet types and age.

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 prevalence was higher when compared with results obtained in other areas in Southwest Nigeria by different workers (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 among 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 5-7years had higher prevalence. This could be because children in this age group are very active domestically, working in fecal 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 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 exposing a large surface of their bodies to infection especially to geohelminths like 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.

CONCLUSION

This study revealed high parasite eggs with a prevalence of 70.5% and three helminthes species among school-aged children in the studied area. It was also observed that Children whose parents were motorcyclist rider had highest infection rate. What is needed is to adopt deworming programme across the states and nation. Improve community sanitation such as safe water, hygienic disposal of faeces, and hand washing after contact with stools is essential and should be integrated into school health programmes. Health education to encourage individuals to adopt behavioural change is advocated.

CONSENT

All authors have declared that written informed consent was obtained from the patients for publication of this case report and accompanying images

ETHICAL APPROVAL

Ethical approval was approved by the Research and Ethical Committee of the University of Port Harcourt. All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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