

Full Length Research Paper

# An evaluation of infection with intestinal helminths among pupils in rural communities in Gwagwada district, Nigeria

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A comparative study on infection with intestinal helminths among pupils in rural and sub-urban primary schools was carried out in Gwagwada district, Chikun Local Government Area of Kaduna State, Nigeria. Faecal samples were collected from 244 pupils in eight rural and sub-urban public schools and examined for eggs of intestinal helminths using the filtration technique and microscopically examined for intestinal parasites. The overall prevalence in both rural and sub-urban pupils was 67.2%, with the sub-urban pupils having a prevalence of 70.8% and the rural pupils a 58.9% prevalence. The five intestinal helminths observed in the study were *Ascaris lumbricoides* (37.0 and 29.8%), *Trichuris trichiura* (4.1 and 4.7%), hookworms (9.6 and 5.3%), *Taenia* species (32.9 and 11.1%) and *Schistosoma mansoni* (21.9 and 1.8%) in rural and sub-urban pupils, respectively. There was no significant association of the prevalence with location. Mass deworming campaign should be embarked upon immediately and sanitation facilities should be provided to curtail these alarming infections.

**Key words:** Helminths, rural, sub-urban, pupils, Gwagwada, Nigeria.

## INTRODUCTION

Soil-transmitted helminth infections are among the most common infections worldwide and affect the poorest and most deprived communities. Latest estimates indicate that more than 880 million children are in need of treatment for these parasites (WHO, 2014). In sub-Saharan Africa, intestinal helminths are the most common and diseases with a very higher negative public health and socio-economic impacts (Enimien et al., 2014; Ojuronbe

et al., 2014).

Parasitic helminths are endemic in Nigeria, due to poor environmental sanitation, pollution, and contamination of water and soil. Children in Nigeria are highly exposed and very vulnerable to these infections (Damen et al., 2010). In rural and sub-urban settlements in Nigeria, intestinal helminthes have been a major problem. This is as a result of their poor socio-economic status and lack of basic

amenities such as pipe borne water and other sanitary facilities (Okon and Oku, 2001) and it may also be due to their illiteracy and careless behaviour(s). Generally, parasitic infections abound in Nigeria not only because a large number of the population still live(s) in insanitary surroundings with constant faecal pollution of soil, food and drinking water, but also as a consequence of the tropical environment, suitable for easy parasitic growth and spread (Adeyeba and Essiet, 2001).

A typical intestinal helminth has an intestinal lifecycle stage. Intestinal helminths of health relevance are nematodes (roundworms), cestodes (tapeworms) and trematodes (flukes). The most common of these helminths in Nigeria are *Ascaris lumbricoides*, *Trichuris trichiura* hookworms (*Necator americanus* and *Ancylostoma duodenale*), *Strongyloides stercoralis* and *Schistosoma* (Odening, 1976; Brooker et al., 2006). Other helminths of human health relevance but not very common in the tropics include: *Taenia* species, *Hymenolepis nana*, *Dicrocoelium hospes* and *Enterobius vermicularis* (WHO, 1994). The lifecycle of most helminths may involve more than one host, interspersed with a free living phase. Intestinal worms lay eggs inside the host body before they are passed out with faeces onto the ground or water as the case may be. The deposited eggs remain in the water/soil until they are ingested by the host. As they are ingested, they hatch into larvae and moult into adults which then start laying new eggs (Parker et al., 2003).

Due to the public health implications of these intestinal parasites, this study was carried out with the aim of comparing the intestinal helminthes infestation among pupils in rural and sub-urban primary schools in Gwagwada district, Chikun Local Government Area of Kaduna State, Nigeria.

## MATERIALS AND METHODS

### Study area

The study was carried out in Gwagwada educational district from January and September, 2006. Four public primary schools, each were randomly selected, from both the rural and sub-urban communities of the educational district, making a total of eight schools. The schools selected were Gwagwada, Dutse, Gazamari and Bakin Kasuwa (sub-urban schools) and Bakin Liza, Bashishi, Gwazunu and Lukuru (rural schools). Fifteen percent of the pupils (both male and female) in each school and class were randomly selected for the study. Approval was obtained from the local government education secretary, and consent from the district education officer, the head teachers of each school and parents/guardian of the pupils was also obtained before sample collection.

### Faecal sample collection

Clean, labelled wide-mouth sample plastic bottles with covers were given out to the selected pupils for the study and were properly instructed on how to collect their early morning faecal sample with-

out contamination using the applicator stick attached to the sample bottle cover. The bottles were then collected from the pupils as they resume for morning classes and the faecal samples were immediately preserved with formalin and were finally taken to the laboratory for analysis. Sample collection was carried out in accordance to internationally best practices (Odoaba et al., 2012; Pham-Duc et al., 2013).

Paper and pen questionnaires were administered to selected pupils through personal interview and information on sex, age, class and school name were collected.

### Laboratory examination of faecal samples

The faecal samples were examined for parasites using the formaldehyde-ether concentration technique as described by Cheesbrough (1992). An aliquot of 1 g of faeces was suspended in 10 ml of 10% formaldehyde solution and mixed with a glass rod. The suspension was passed through a funnel covered with a gauze pad, to remove debris into a centrifuge tube. Three millilitres of ether was added and the suspension thoroughly mixed. The tubes were centrifuged for 3 min at 4000 rpm. Four layers were formed at the end of the centrifugation. The first layer was the ether with fats dissolved in it, the second was the debris, the third was the formaldehyde solution and the fourth was the sediment of eggs and/or larvae.

The centrifuge tubes were decanted, leaving only the sediment. The sediment was examined by sampling a drop with a pipette and depositing it on a glass slide. The slide was covered with a slide cover slip and examined microscopically using X10 and X40 objectives of the microscope as describe by Cheesbrough (1992). The eggs/larvae were identified using Atlas of Medical Helminthology and Protozoology as well as Medical Parasitology (Jeffrey and Leach, 1975; Arora and Arora, 2010).

### Statistical analysis

The data obtained in the study are shown in Tables 1, 2, 3, 4 and 5, interpreted in percentages and analysed with respect to rural and sub-urban schools, age, sex, class and type of helminth infection. Chi square was used to test for association of prevalence with rural and sub-urban pupils across class of study, sex and age using Excel Microsoft (2010).

## RESULTS

The prevalence of intestinal helminths among the rural and sub-urban pupils and their distribution with schools are presented in Table 1. Out of a total of 244 pupils, in both rural and sub-urban schools examined, 164 pupils were found to be positive with at least one of the helminth parasites, which gave a prevalence of 67.2%. Among the rural schools, 43 (58.9%) pupils were found to be positive out of the 73 pupils examined, while 121 (70.8%) pupils were recorded positive out of 171 pupils examined among the sub-urban schools.

The highest prevalence (76.6%), among all the schools was recorded in Dutse, a sub-urban area, and was followed by Lukuru (73.3%), a rural area, while the lowest prevalence (41.6%) was obtained in Gwagwada, the district headquarters.

The results, as shown in Table 2, indicate the sub-urban

**Table 1.** Prevalence in rural and sub-urban schools.

School	Rural		School	Sub-urban	
	No. examined	No. positive (%)		No. examined	No. positive (%)
Bakin Lizza	15	8 (53.3)	Gwagwada	77	53 (68.8)
Bashishi	18	9 (50.0)	Dutse	64	49 (76.6)
Gwazunu	25	15 (60.0)	Gazamari	11	7 (63.6)
Lukuru	15	11 (73.3)	Bakin Kasuwa	19	12 (63.2)
Total	73	43 (58.9)	Total	171	121 (70.8)

**Table 2.** Prevalence by sex in rural and suburban schools.

School	Male		Female	
	No. examined	No. positive (%)	No. examined	No. positive (%)
Rural	45	26 (57.7)	28	17 (60.71)
Suburban	99	73 (73.74)	72	48 (66.67)

Males  $\chi^2 = 3.7$ ; df = 1; p = 0.05 and Females  $\chi^2 = 0.3$ ; df = 1; p = 0.05

**Table 3.** Prevalence by age group in rural and sub-urban schools.

Age (Years)	Rural		Sub-urban	
	No. examined	No. positive (%)	No. examined	No. positive (%)
7-9	19	13 (68.4)	49	38 (77.6)
10-12	17	11 (64.7)	43	32 (74.4)
13-15	14	8 (57.1)	41	27 (65.9)
>16	23	11 (47.8)	38	24 (63.2)

$\chi^2 = 2.1$ ; df = 3; p = 0.05.

pupils had the higher prevalence in both males (73.7%) and females (66.7%) than the male and female pupils in rural areas. However, there was no significant association with sex between rural and sub-urban prevalence ( $P > 0.05$ ).

When compared across age groups (Table 3), the group of 7 to 9 years in sub-urban schools had the highest prevalence (77.6%), while the group >16 years in rural schools had the lowest prevalence (47.8%). Though, there was no significant association of prevalence with age between the two areas, there was a decline in prevalence as the age increased, in both areas.

The highest prevalence (80.0%) was obtained in sub-urban schools among Primary 4 pupils while the lowest prevalence of 47.8% was among Primary 6 pupils of sub-urban schools. Though no significant association was found, there was slight decline in prevalence as one went higher the classes (among rural schools) from Primary 1 to 3, a slight increase in Primary 4 and a continuous decline in Primary 5 and 6. The prevalence among sub-urban pupils, across classes showed a staggered pattern (Table 4).

*Ascaris lumbricoides* was the most prevalent helminth, with 37.0 and 29.8% among both rural and sub-urban pupils, respectively (Table 5). *Schistosoma mansoni* had the lowest prevalence (1.8%) among sub-urban pupils, but slightly higher among the rural pupils (21.9%).

## DISCUSSION

The overall high prevalence (67.2%) of intestinal helminth infections among both rural and sub-urban pupils is similar to the high prevalence (80.9%) by Damen et al. (2011) reported among almajiris, 59.1% among primary school pupils by Usip et al. (2013). This could be attributed to carelessness and unhygienic behaviour(s) among these pupils both at home and in school. Lack of sanitation facilities in these schools might have also contributed to the high prevalence. In all the selected schools and environs, it was observed that there were no toilet facilities or, where present, they were not functional or no adequate water supply. The pupils mostly defecate in open field both at home and in school.

**Table 4.** Prevalence with class between rural and sub-urban schools.

Class	Rural		Sub-urban	
	No. examined	No. positive (%)	No. examined	No. positive (%)
Primary 1	16	11 (68.8)	35	23 (65.7)
Primary 2	8	5 (62.5)	29	22 (75.9)
Primary 3	12	7 (58.3)	27	20 (74.1)
Primary 4	10	6 (60.0)	30	24 (80.0)
Primary 5	13	7 (53.8)	27	21 (77.8)
Primary 6	14	7 (50.0)	23	11 (47.8)

<sup>2</sup> = 1.3; df = 5; p = 0.05.

**Table 5.** Prevalence with type of helminthes between rural and sub-urban schools.

Type of helminth	Rural		Sub-urban	
	No. examined	No. positive (%)	No. examined	No. positive (%)
<i>Ascaris lumbricoides</i>	73	27 (37.0)	171	51 (29.8)
<i>Trichuris trichiura</i>	73	3 (4.1)	171	8 (4.7)
Hookworm	73	7 (9.6)	171	9 (5.3)
<i>Taenia</i> spp.	73	24 (32.9)	171	19 (11.1)
<i>Schistosoma mansoni</i>	73	16 (21.9)	171	3 (1.8)

Consequently, the faeces could contaminate nearby household and school environments with eggs from geohelminths, and this might have resulted to the high counts from this study. The pupils could have picked up the eggs from the contaminated soils during extracurricular activities and through eating with dirty, contaminated hands, thus leading to infection which affects the health, well-being and the academic performance of the pupils.

The very high prevalence ratio of infection obtained in this study is similar to that reported by Leykun (2001) in a study in Ethiopia among school children and that of Sebastián and Santi (2001) among Naporuna school children in the Low-Napo region, North- Eastern Ecuador. A high prevalence (77%) of intestinal geohelminthiasis among school children in riverine communities of Nigeria was reported by Ariyo et al. (2007).

Majority of the parents/guardians of these school pupils are either farmers or nomadic cattle rearers, having little or no education on good hygienic behaviour and so, children are not under adequate adult supervision of their sanitation habits even at home.

The insignificant association in prevalence between sex and locality could be due to the common lack or poor sanitation facilities and portable drinking water. The higher prevalence recorded among males in both rural and sub-urban pupils matches with the reports of Ajibola (2013), Ajibola and Hassan (2013), Alemu et al. (2011), Leykun (2001) and Sehgal et al. (2010), but contrary to the findings of Amaechi and Okore (2013). This could be

attributed to the activities the males get involved in, which predispose them to infection, such as swimming, fishing, farming, football and other sports which females are mostly not involved in. The slight decrease of infection with increase in age may be due to increase in hygiene and behavioural changes that mostly come with increases in age and this also applies to the prevalence across the classes. In both rural and sub-urban pupils, the highest prevalence of *A. lumbricoides* corresponded with the reports of Ajibola (2013), Ajibola and Hassan (2013), Ekpenyong et al. (2008), Emeka (2013), Usip et al. (2013), Damen et al. (2011) and Ojurongbe et al. (2014), but are contrary to that of Odooba et al. (2012) that reported hookworm to have the highest prevalence among children in Zaria.

## Conclusion

In conclusion, there was a very high prevalence of intestinal helminths among pupils in these rural and sub-urban areas, which reveals that intestinal helminthes are endemic in these areas. *Ascaris lumbricoides* has a very high prevalence among pupils. The health status of rural and sub-urban pupils was not significantly different, because the available social, health and sanitary facilities in these areas are not different in any way. There is a need for the state/local government and Non-Governmental Organizations (NGOs) to embark on urgent mass deworming campaigns among all pupils, and

potentially all people living in these areas. The need for health/hygiene education and awareness among pupils, parents/guardians, teachers and food vendors will contribute immensely for improving their behaviour. Government agencies, at state and local levels, should provide more facilities, such as boreholes, toilet facilities, good drainage system and other basic facilities that will promote more healthy living conditions.

## CONFLICT INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this article.

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