ORIGINAL ARTICLE

AFRICAN JOURNAL OF CLINICAL AND EXPERIMENTAL MICROBIOLOGY SEPTEMBER 2006 ISBN 1595-689X VOL 7 No 3
AJCEM/200637/2635 http://www.ajol.info/journals/ajcem
COPYRIGHT 2006 AFR. J. CLN. EXPER. MICROBIOL. 7(3): 208-211

INTESTINAL HELMINTHES INFESTATION AMONG PUPILS IN RURAL AND URBAN COMMUNITIES OF KWARA STATE, NIGERIA

***Adefemi S. A.; *Musa O. I.**

***Department of General Medical Practice, University of Ilorin Teaching Hospital,**
***Department of Epid. & Community Health, University of Ilorin Teaching Hospital,**

Abstract

Background: There are good theoretical reasons to think that urban and rural communities will have different risk factors for geohelminth infestation, and that the rural areas are more likely to suffer more helminthic infections than urban areas. This is because of the likely preponderance of factors that favour the continued existence of worms are mostly found in rural communities. These are low socioeconomic status of the people, and total absence of, or inadequate basic social amenities like good drainage network, pipe borne water supply and waste disposal facilities.

Objective: To compare the prevalence and intensity of intestinal helminth among pupils in rural and urban communities and to identify the risk factors associated with the infestation.

Methods: This cross-sectional study was carried out among 304 rural and urban pupils randomly selected from 2 communities in kwara state, Nigeria. Semi-structured questionnaires were administered to the pupils and each of them had a stool sample collected and examined microscopically for ova of helminthes.

Results: The prevalence of helminthic infection in the rural and urban pupils was 17.6% and 18.5% respectively. The helminthes isolated in the stool samples were Ascaris *lumbricoides*, Trichuri *trichiuria* and hookworms. Ascaris *lumbricoides* constituted over three-quarters of the total helminthes isolated. The intensity of infestation with Ascaris *lumbricoides* and Trichuri *trichiuria* was moderate among the pupils in both rural and urban areas. However, Hookworm showed heavy intensity of infestation among pupils from the rural area as evident by high mean egg load of the parasite in the stool. Factors that were significantly associated with the risk of acquisition of the infestation included age of the pupils, educational status of the mother and type of toilet facilities used by the pupils at home.

Conclusion: The prevalence of intestinal helminth in the rural and urban pupils was similar and low compared to what was reported in other local studies carried out 5years back. The risk factors for the infestation give the impression that all school pupils, regardless of where they stay or live in Nigeria are at risk of helminthiasis.

Recommendation: Children in both rural and urban areas must both be targeted in any anti helminth campaign since the dwelling place has not shown any reasonable risk factor among the 2 groups of pupils.

Key words: intestinal helminth, school children, mean egg load of helminthes.

Correspondence: Dr. Adefemi S. A.Department of General Medical Practice, Federal Medsical Center, Bida.,Nigeria. E mail: samueladefemi@yahoo.com

INTRODUCTION

The public health impact of helminthic infestation has consistently been under-estimated. This is based on the fact that disease states mostly manifest at a chronic stage. Diseased states have also been reported to manifest earlier, where there are factors in the host that compromise the ability of the host to fight infection.(1)

The population mostly at risk is school-aged children, who may suffer nutritional deficits, cognitive impairment, serious illnesses, and occasionally deaths rarely from complications of helminth infestation. Thus the risk of an individual suffering geohelminth related morbidity appears to be a joint function of the species harboured, the intensity of infestation and / or the virulence of the specy (1,2) The growing body of literature has identified different risk factors that perpetuates the existence of helminths in the communities, and these are individual, household, cultural and environmental factors. (3)

Generally, rural areas are expected to have higher worm load, than the urban area, because of the preponderance of those factors that perpetuate the continued existence of the worm, such as poverty, poor environmental hygiene, and complete absence of municipal services (1,4,5). Local studies have shown prevalence of helminthes in children in rural areas to be in range of 30% to 74% (4,6-8). while studies focusing on urban areas are mostly hospital based with prevalence ranging from 15–30% (9-11)

The importance of risk. factors in initiating and perpetuating the continued spread of geohelminth infestation cannot be overemphasized. Knowledge of these factors will guide and inform preventive activities at the primary care level, and in initiating governmental policies that will help in the control of helminthes infestation. A comparative study of rural and urban communities will therefore provide current epidemiological status of helminths, in terms of the prevalence, intensity, and transmission dynamics with a view to identifying needs or areas for better intervention.

METHODS

This descriptive cross-sectional survey was conducted between April and July 2003 in rural Ganmo community and urban community of Ilorin metropolis of Kwara state. The population surveyed was primary school pupils aged 6 – 12 years attending public primary schools in the study areas. From the list of public primary schools in Ilorin, simple random sampling technique was employed to select Baptist LGEA primary school in Ilorin metropolis by balloting. The only public school in Ganmo (Community LGEA) was used for the study. Systematic random sampling technique using the school registers was used to select 344 pupils (158 from the rural and 186 from the urban) for the study. Where the selected pupil was unwilling to participate in the study, the next student on the

register was chosen and the sampling interval maintained. Pupils with history of use of anti-helminthic drug in the last 6months prior to the study were excluded.

Semi-structured questionnaire was administered to each pupil and a stool sample collected for microscopic examination. The interval between stool collection and laboratory processing was 8 – 12hours. Saline and iodine preparations of the faecal specimens were made for microscopic examination, while formol ether sedimentation technique was used to concentrate the stool for ova counting. Stoll's method was used to determine the egg count per gram of the faeces(12)

The World health Organization (WHO) method of classification of intensity of ova of parasite in stool was used to classify the mean egg load (appendix 1) (13) The major limitation in the study was the use of formal ether sedimentation method to concentrate the ova of helminth in stool. This method is not suitable for identification of *Enterobius vermicularis* ova, hence some of the pupils with this worm might be missed which may make the prevalence of intestinal helminth to be lower than the actual.

RESULTS

In all, 304 pupils (153 rural and 151 urban) out of 344 were involved in the study giving a participatory rate of 97% and 81% for the rural and urban areas respectively. Majority of the pupils were female 166(54.6%) and predominantly in the age group 9 – 11years in the 2 schools, Table. The

The helminthes isolated in the stool samples included Ascaris *lumbricoides*, Trichuris *trichiuria* and hookworms. Ascaris *lumbricoides* constituted over three-quarters of the total helminthes isolated. Moderate infestation with Ascaris and Trichuris were mostly seen among the pupils in both areas. Only hookworm, showed heavy infestation and only among pupils from the

prevalence rate for helminthes infestation was similar among pupils in both the rural (17.6%) and the urban (18.5%) schools. The infestation cut across the whole school age groups, although pupils in age 12years and above showed slightly higher number of infestations but this was not significant. Table 2

rural area. The mean egg load for helminthes encountered was generally higher in rural than urban. The mean egg load for both communities statistical differences in number of cases of helminthes infestation among pupils in rural and urban areas. (Table 4)

Appendix 1: WHO classification of intensity for soil transmitted helminth infections in stool examination. [13]

Helminth	**Light intensity of infections**	**Moderate intensity of infections**	**Heavy intensity of infections**
A. lumbricoides	1-4999epg	5000-49999epg	≥50000epg
T. trichiura	1-999epg	1000-9999epg	≥10000epg
Hookworms	1-1999epg	2000-3999epg	≥4000epg

Epg= eggs per gram of faeces

TABLE 1: SOCIO DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Demographic Variables	Rural (N=153) n (%)	Urban (N=151) n (%)	Total (N=304) n (%)
Age groups (years)			
6-8	51 (33.3)	53 (35.1)	104 (34.2)
9-11	62 (40.5)	82 (54.3)	144 (47.4)
≥12	40 (26.1)	16 (10.6)	56 (18.4)
Mean & Standard deviation	9.2 ± 2.0yrs	9.2 ± 1.7yrs	9.2 ± 2.0yrs
Sex			
Male	65 (42.5)	73 (48.3)	138 (45.4)
Female	88 (57.5)	78 (51.7)	166 (54.6)
Mother's educational level			
primary and below	132 (86.3)	85 (56.3)	217 (71.4)
post primary	21 (13.7)	66 (43.7)	87 (28.6)
Mother's occupation			
civil servants	5 (3.3)	14 (9.3)	19 (6.3)
artisans	17 (11.1)	16 (10.6)	33 (10.9)
traders	119 (77.8)	114 (75.5)	233 (76.6)
farmers	2 (1.3)		2 (0.7)
unemployed	10 (6.5)	7 (4.6)	17 (5.6)
Father's educational level			
primary and below	126 (82.4)	98 (64.9)	224 (73.7)
post primary	27 (17.6)	53 (35.1)	80 (26.3)
Father's occupation			
civil servant	37 (24.2)	41 (27.2)	78 (25.7)
artisans	89 (58.2)	72 (47.7)	161 (53.0)
traders	11 (7.2)	24 (15.9)	35 (11.5)
farmers	16 (10.5)	14 (9.3)	30 (9.9)

Table 2a: Age specific Prevalence of infestation among the pupils

Age group (years)	RURAL COMMUNITY		URBAN COMMUNITY		TOTAL FOR 2 COMMUNITIES
	Total children in the age group n(%)	Age specific Prevalence of infestation n(%)	Total children in the age group n(%)	Age specific Prevalence of infestation n(%)	Age specific prevalence for both schools n(%)
6 – 8	51 (33.3)	62 (40.5)	53 (35.1)	11(20.8%)	17 (16.3)
9 – 11		11(17.7%)	82 (54.3)	15(18.3%)	26 (18.1%)
>12	40 (26.1)	10(25%)	16 (10.6)	2(12.5%)	12 (21.4%)
Total	**153 (100%)**	**27(17.6%)**	**151(100%)**	**28(18.5%)**	**55(18.1%)**

Table 2b: Relative proportion of helminthes isolated in faecal specimens

Helminthes	Rural n=153	Urban n=151	Total for 2 schools n=304
Ascaris	22 (14.4%)	22 (14.6%)	44 (14.5%)
Trichuiris	2 (1.3%)	4 (2.6%)	6 (2.0%)
Hookworm	3 (2.0%)	2 (1.3%)	5 (3.3%)
Total	**27 (17.6%)**	**28 (18.5%)**	**55 (18.1%)**

TABLE 3: INTENSITY OF INFESTATION AND MEAN EGG LOAD OF EACH HELMINTH

HELMINTH	INTENSITY OF INFESTATION (RURAL PUPILS)				INTENSITY OF INFESTATION (URBAN PUPILS)			
	Light n(%)	**Moderate n(%)**	**Heavy n(%)**	**Total**	**Light n(%)**	**Moderate n(%)**	**Heavy n(%)**	**Total**
Ascaris	5(23%)	17(77%)	0	22(100%)	8(36%)	14(64%)	0	22(100%)
Trichuris	0	2(100%)	0	2(100%)	0	4(100%)	0	4(100%)
Hookworm	0	0	3(100%)	3(100%)	1(50%)	1(50%)	0	2(100%)
TOTAL	5	19	3	27	9	19	0	28

HELMINTHES	**Mean & Standard deviation** (RURAL PUPILS)	**Mean & Standard deviation** (URBAN PUPILS)
Ascaris	14,821 ± 11,705	9,587 ± 10,270
Trichuris	3,900 ± 2404	4,275 ± 3,508
Hookworm	7,100 ± 3536	1,700 ± 849

TABLE 4: COMPARISON OF RISK FACTORS FOR HELMINTHES INFESTATION AMONG PUPILS FROM RURAL AND URBAN AREAS

Variable	INFESTED N_1=55		P Value	NOT INFESTED N_2=249		P Value
	Rural N=27 n (%)	Urban N=28 n (%)		Rural N=126 n (%)	Urban N=123 n (%)	
Age group (yrs)						
6-8	6 (11.8)	11 (20.8)	**0.025**	45 (88.2)	42 (79.2)	**0.005**
9-11	11 (17.7)	15 (18.3)		51 (82.3)	67 (81.7)	
≥12	10 (25.0)	2 (12.5)		30 (75.0)	14 (87.5)	
Sex						
Male	10 (15.4)	10 (13.7)	**0.919**	55 (84.6)	63 (86.3)	**0.232**
Female	17 (19.3)	18 (23.1)		71 (80.7)	60 (76.9)	
Mother's educational level						
Primary and below	22 (16.7)	11 (12.9)	**0.001**	110 (83.3)	74 (87.1)	**0.000**
Post primary	5 (23.8)	17 (25.8)		16 (76.2)	49 (74.2)	
No of persons living in household						
1-2	0 (0.0)	0 (0.0)	**0.324**	9 (100.0)	1 (100.0)	**0.023**
3-4	3 (12.0)	7 (29.2)		22 (88.0)	17 (70.8)	
≥5	24 (20.2)	21 (16.7)		95 (79.8)	105 (83.3)	
Type of toilet						
pit latrine	11 (19.0)	10 (22.7)	**0.018**	47 (81.0)	34 (77.3)	**0.000**
water closet	3 (10.0)	12 (16.7)		27 (90.0)	60 (83.3)	
bush	13 (20.0)	6 (17.1)		52 (80.0)	29 (82.9)	
Eating in the school						
yes	20 (16.4)	26 (18.4)	**0.129**	102 (83.6)	115 (81.6)	0.003
no	7 (22.6)	2 (20.0)		24 (77.4)	8 (80.0)	

DISCUSSION

Intestinal helminth infestations persist and flourish wherever poverty, inadequate sanitation, improper health habits, and overcrowding are entrenched. In Nigeria, these factors are present in both rural and urban communities. Rural children may be considered to be at relatively higher risk than urban children, because these risk factors are more pronounced in rural than urban centres. The overall prevalence of helminthes in this study was relatively low and similar for both rural and urban pupils. It was a surprise to see that the prevalence was about the same in children from the 2 communities. Similar findings was reported in Pemba Island, Zanzibar, Tanzania in East Africa(14).

There had been attempts to explain why urban children may be as much susceptible to helminthic infestation like their rural counterpart by *Crompton et al* (15). Their study revealed overcrowding and the technical problems in sewage disposal as probable factors. The meagre resources of the cities are often overstretched and their social services of water supply, sanitation, garbage disposal, health care are inadequate. These factors may be responsible for the insignificant differences in prevalence between the urban and rural pupils.

The relatively low prevalence observed in this study contradicts reports from previous local studies where higher prevalence ranging from 33.6% to 74.8% for rural (4,6-8) and 20 – 30% for urban were reported. (9-11).

The low prevalence does not appear to be due to good personal hygiene among the pupils, but may be related to routine use of anti-helmintic drugs. Mass de-worming campaign by Government as well as the incorporation of anti-helmintic drugs into the maternal and child health (MCH) programme by the Federal Government probably contributed more than any factor to this low prevalence. The majority of infested cases seen probably represented re-infested cases or those who for one reason or the other had not used anti-helmintics.

The female pupils had a relatively high prevalence rate than males in both communities.(Table 4) Differences in infestation between male and female are occasionally reported, but more often than not, the prevalence of infestation is either similar in both sexes,[16, 17] or males have an edge over the female.[7,18] However, few local studies have reported female sex having a higher prevalence than their male counterpart[9,11] The probable explanation for the female sex having higher prevalence in this study is that the female gender is more exposed to potential domestic sources of transmission of these helminths, like food preparation, fetching water, and disposal of waste than their male counterpart. However, the influence of gender on prevalence of helminthic infection is inconclusive as it may or may not play a role depending on the regional and environmental factors.

Of the three helminths detected in this study, *A. lumbricoides* was the most prevalent, accounting for over 80% of infestations among the pupils in the 2 communities. The other two parasites, T. *trichiura*, and hookworm were very low in prevalence. This pattern was in agreement with some studies (9,19) but at variance with others (7,20).The relatively high prevalence of A. *lumbricoides* in this study might be due to climatic and environmental conditions of the communities, such as poor water supply and poor sanitation facilities, which could be more favourable for *A. lumbricoides* than the other worms. It may also be due to the presence of other unknown risk factors. Multiple infestations were low in this study. This may be related to frequent mass campaigns against

helminth infestation via community based distribution of antihelmintic drugs in the state, in the last 3 years.

Infestation with intestinal helminth is associated with a wide range of variables, and the pattern is often determined by cultural, behavioural, household and individual factors. Factors like pupil's age, maternal education and type of toilet facility at home were found to be significantly associated with risk of acquisition of helminthic infestation. While other prevalence studies noted that the highest prevalence of intestinal helminthes occur in children aged 5-12 years (4,19). This study found that age specific prevalence rate was greater for age 12years and above, although this is not statistically significant. This is particularly obvious among rural pupils. Other age groups showed uniform rate of infection as reported in other literatures (3,4). The reason why this age group is at the greatest risk of acquiring helminth might be due to frequency of host-parasite contact as children in that age group would be expected to be able to assist their parents in domestic work like cooking and fetching water.

Lack of or low formal educational status of mothers has consistently been associated with likelihood of worm infestation in children. For example, two separate studies in Malawi and Panama, reported that mothers with little or no education had significantly higher number of children infected with helminthes than mothers who are of high educational status and lived in the same area or community.[21] Our finding is contrary as kids of urban mothers with at least post primary education had higher prevalence of worm infestation than kids of urban mothers with primary or no formal education. (Table 4) This contrasting finding may be due to the increasing number of women in the workforce, leaving their children no choice but to patronize food vendors.[22]

The use of pit latrine strictly speaking is associated with a lower risk of acquisition of intestinal helminth compared to the use of open bush, as it reduces contact between persons and the infective larvae. But where the provision of pit latrine is not accompanied with adequate supply of water, the chances of faecal contamination becomes higher (23). Furthermore, the unacceptably high number of persons per toilet (over-crowding), improper usage and poor quality hygiene of the toilet have been shown to influence acquisition of intestinal helminth. (20,23) Against the background of polygamy (large family greater than five persons, living in single room of shared apartment), and poor water supply within the communities studied, our findings among those using pit latrine is not surprising: It may thus be summarized, that while the use of pit latrine protect against intestinal helminth, it must be provided alongside with adequate water supply to ensure personal cleanliness and the cleanliness of the latrine.(24). One may state that where water supply is in short supply, the construction of ventilated improved pit latrine could serve as an alternative.

CONCLUSION:

The prevalence of intestinal helminth in rural and urban communities studied were similar and within the national average of 14 -30%. The determinants of infestation in both rural and urban area include age of child, level of maternal education and type of toilet facilities at home.

REFERENCES

1. Flores A, Esteban JG, Angles R, Mas-Coma S. Soil transmitted helminth infections at very high altitude in Bolivia. *Transaction of the Royal Society of Tropical Medicine and Hygiene*. 2001; **95**:272-277.
2. Booth M, Bundy DAP, Albonico M, Chwaya HM, Alan KS, Savioli L. Associations among multiple geohelminth species infections in school children from Pemba Island. *Parasitology* 1998; **116**: 85-93.
3. Curtale F. Pezzotti P. Saad YS, Aloi A. An analysis of individual, household, and environmental risk factors for intestinal helminth infections among children in Qena Governorate, Upper Egypt. *Journal of Tropical Paediatrics*. 1999; **45**:14-17.
4. Arinola O, Fawole O. Age and sex graded helminth infections in a Nigerian village. *East African Medical Journal*. 1995; **72**(2):110-112.
5. Ejezie GC. The parasitic disease of school children in Lagos state, Nigeria. *Acta Tropica*. 1981; **38**:79-84.
6. Zoakah AI, Idoko LO, Okonkwo MO, Adeleke AO, Kpamor Z. Intestinal helminthic infection and malnutrition in pre-school children in Utan Village, Jos, Plateau State. *Nigerian Medical Practitioner*. 1999; **37** (5/6):67-69.
7. Meremikwu MM, Antia-obong OE, Asindi AA, Ejezie GC. Prevalence and intensity of intestinal helminthiasis in preschool children of peasant farmers in Calabar, Nigeria. *Nigerian Journal of Medicine*. 1995; **4**(2):40-44.
8. Ibrahim M, Odoemena DI, Ibrahim MT. Intestinal helminthic infection among primary school children in Sokoto. *Sahel Medical Journal*. 2000; **3**(2):65-68.
9. Musa OI. Intestinal helminthiasis among students seen during school entrance medical examination in Ilorin. *Journal of Community Medicine and Primary Health Care*. 1997; **9**:35-41.
10. Ighogboja IS, Ikeh EI. Parasitic agents in childhood diarrhoea and malnutrition. *West African Journal of Medicine*. 1997; **16**(1):36-39.
11. Elekwa DE, Ikeh EI. A survey of the incidence of intestinal parasites amongst primary school children in relation to socio-economic factors in Jos, Nigeria. *Nigerian Medical Practitioner*. 1996; **31**(4): 60-62.
12. Markell EK, Voge M, John DT. Examination of stool specimen in: Medical Parasitology. Philadelphia: W.B.Saunders Company. 1992:406-428.
13. Prevention and control of schistosomiasis and soil transmitted helminthiasis. Report of a WHO Expert Committee. WHO Technical Report Series 912. World Health Organisation, Geneva.
14. Albonico M, DeCarneri I, DiMatteo L, Ghiglietti R, Toscano P, Uledi

MK, *et al.* Intestinal parasitic infections of urban and rural children on Pemba Island: implications for control. *Annals of Tropical Medicine and Parasitology*.1993; **87**(6):579-583.

15. Crompton DWT, Savioli L. Intestinal parasitic infections and urbanization. *Bulletin of the World Health Organisation*. 1993; **71**:1-7.

16. Anderson TJC, Zizza CA, Leche GM, Scott ME, Solomon NE. The distribution of intestinal helminth infections in a rural village in Guatemala. *Mem Inst Oswaldo Cruz*. 1993; **88**:53-65.

17. Palmer DR, Bundy DAP. Epidemiology of human hookworm and Ascaris lumbricoides infestations in rural Gambia. *East African Medical Journal*. 1995; **72**:527-530.

18. Curtale F, Pezzotti P, Sharbini AL, Al Maadat H, Ingrosso P, Saad YS, *et al.* Knowledge, perception and behaviour of mothers towards intestinal helminths in Upper Egypt: implications for control. *Health Policy and Planning*. Oxford University Press. 1998; **13**(4):423-432.

19. Gbakima AA, Sherpard M, White PT. Intestinal helminth infections in rural school children in Njala; Sierra Leone. *East African Medical Journal* 1994; **71**(2): 792-796.

20. Ali I, Mekete G, Wodajo N. Intestinal parasitism and related risk factors among students of Asendabo elementary and juniour secondary school, south western Ethiopia. *Ethiopian Journal of Health Development*. 1999; **13**(2): 157-161.

21. Phiri K. Whitty CJM, Graham SM, Ssembatya–lule G. Urban/rural differences in prevalence and risk factors for intestinal helminth infection in southern Malawi. *Annals of Tropical Medicine and Parasitology*. 2000; **94**(4): 381-387.

22. Musa OI. Promoting the safety of street-vended food in developing countries. *Savannah Medical Journal*. 2002; **4**(2): 8-10

23. Tshikuka JG, Scott ME, Gray-Donald K. Ascaris lumbricoides infection and environmental risk factors in an urban African setting. *Annals of Tropical Medicine and Parasitology*. 1995; **89**: 505-514.

24. Salako AA. Effects of Portable water availability on intestinal parasitism among rural school children with sewage disposal facilities in the Majidun and Owutu sub-urban community of Lagos State. *Nigerian Medical Practitioner*. 2001; **39**(3/4):30-35.