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THE PREVALENCE OF GEOHELMINTHIASIS AND INTESTINAL SCHISTOSOMIASIS IN PRIMARY SCHOOL PUPILS IN WARAWA LOCAL GOVERNMENT AREA OF KANO STATE, NIGERIA

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Abstract

This study investigates the abundance and possible risk factors associated with Geohelminths and Intestinal Schistosoma parasites. A total of 600 pupils were randomly selected from twelve primary schools for the study. Stool samples were collected and analyzed using the direct smear method and the formol-ether concentration technique. Out of the 600 pupils examined, 95(15.8%) were infected with at least one or two soil transmitted helminths and schistosomes. Four different Species of soil helminths and schistosomes were isolated from the stool samples. The results indicate that the Parasites recorded were Schistosoma mansoni 45(7.5%),

Strongyloides stercoralis 2(2.3%), Ascaris lumbricoides 12(2.0%) and Hookworm 36(6.0%). The male pupils had the highest prevalence (17.8%) than the females (13.8%). The difference was not statistically significant (P≤0.05). The age group 3-5 years had the lowest prevalence of infection (7.9%) compared with other age groups, however, there is no statistically significant difference in the prevalence among various age groups (P≤0.05). The risk factors associated with the infection of the parasite were types of toilet used (OR=1.42), sources of water (OR=1.4), water contact activities (OR=1.2) parent occupation (OR=0.98) and personal hygiene (OR=0.98).Suggested efforts to control the parasite in pupils include regular de-worming exercises, adequate and proper information on public education and the supply of potable drinking water.

Key words: **Geohelminths, intestinal Schistosomes, infection, risk factors**

Introduction

The study investigates the Prevalence of Geohelminthiasis and Intestinal Schistosomiasis among Primary School Pupils in Warawa Local Government. Geohelminths are soil transmitted parasites whose immature stages (eggs) require a period of development or incubation in the soil before becoming infective. These are *Ascaris lumbroides*, Hookworm, *Trichuris trichuira* and *Strongyloides stercolaris* (Cheesbrough, 2000). Intestinal helminth infections constitute significant public health problems in many developing countries. More than 3.5 billion people worldwide are currently infected with one or more species of intestinal helminths (Crompton, 1999). Children are at the greatest risk of helminthiasis, which are often associated with poor growth, reduced physical activity and impaired learning ability (Stephenson, 1993). An increasing number of studies of helminth epidemiology has shown that it is common for individuals to be infected with more than one species of helminth (Booth, Bundy, Albonico, Chwaya and Alawi, 1998; Fleming, Rodwell and Tower, 2006).

The Burden of the Disease

Geohelminthiasis is the second largest leading cause of mortality in children greater than six years of age in Africa (Ogbe, Magnussen, Ouma and Friss, 2002). The infection is promoted by poor personal hygiene habits, such as indiscriminate disposal of human and animal faeces. The habits permit the contact of faeces and its accompanying microbial load, including geohelminth eggs with soil. Other risk factors include lack of safe water sources, overcrowding, poverty, geophagy, failure to wear footwear and having pools of water/sewage around houses (Phiri, Whilty, Graham and Ssembatya, 2002).

Schistosomiasis (also known as Bilharzia, Bilharziasis or snail fever) is a parasitic disease caused by several species of

trematodes (platyhelminth infection or “flukes”), a parasitic worm of the genus *Schistosoma*. Snails serve as the intermediary agents between mammalian hosts. Individuals within developing countries who cannot afford proper water and sanitation facilities are often exposed to contaminated water containing the infected snails. Although it has a low mortality rate, schistosomiasis often is a chronic illness that can damage internal organs and, in children, impair growth and cognitive development. The urinary form of schistosomiasis is associated with increased risk for bladder cancer in adults. Schistosomiasis is the second most socio-economically devastating parasitic disease after malaria (Schistosomiasis Control Program, 2007). This disease is most commonly found in Asia, Africa and South America, especially in areas where the water contains numerous freshwater snails, which may carry the parasite. The disease affects many people in developing countries, particularly children who may acquire the disease by swimming or playing in infected water.

The nutritional consequences of intestinal infections caused by geohelminth species are substantial. For example, ascariasis has been linked with decreased fat, protein and vitamins that are absorbed by the parasite (O’Lorcain and Holland, 2000). Iron deficiency anemia (Curtale, Pezzotti, Sharbini and Ingrosso, 1993; Stoltzfus, Kvalsvig, Hwaya, Motresor, Albonico, Tielsch, Savioli and PoPllih, 2001) and in the case of severe infection, intestinal obstruction (De Silva, Guyatt and Bundy, 1997). Trichuriasis often occurs in tandem with ascariasis. It is estimated to cause morbidity in 87.133 million persons worldwide, heavy trichuriasis anemia, growth retardation, reduced cognition development in children (Chan, 1997). The major health consequence of hookworm infection is anemia. Stoltzfus *et al*. (2001) have reported that hookworm was responsible for 25% of all anemia cases and 35% of those caused by iron deficiency among the 3,595 school children in the study. Intensity of infection is measured by the number of eggs per gram of faeces, generally by the kato-katz fecal thick smear technique for *A. lumbricoides* and *T. trichura.* The most intense infections are found in children aged 5 – 15 years. A decline in intensity and frequency may indicate changes in exposure, acquired immunity or a combination of both, which still remains controversial. In addition to clinical effects, severe and chronic infection, intestinal parasitic infection also has consequences on cognitive performance and the educational achievement of school children during their development. Recent studies conducted throughout the developing world have provided evidence that school children infected with intestinal parasites perform poorly in tests of cognitive function (Drake, Druilhe, Tall, Sokhna and Bundy, 2000).

The magnitude of the disease burden has spurred a global control programme, which includes universal targeting and periodic administration of anti-helminthic drugs to high risk groups. The implementation of these strategies requires a broader epidemiological perspective of the risk factors. Large scale environmental sanitation programmes are complex,

making interventions, directly aimed at the transmission of geohelminths, a challenge. An increasing number of studies of helminthes epidemiology has shown that it is common for individuals to be infected with more than one species of helminthes (Booth *et al.*, 1998; Fleming *et al*., 2006). The global prevalence of soil transmitted helminth is high. Recently, estimates indicate that approximately 1,472 million people have roundworm infection and 1,049 million people have whipworm infection (Crompton, 1999). In Nigeria, a considerable amount of human and animal waste is discharged into the soil daily, leading to the seeding of the soil with pathogenic organisms, including geohelminth eggs and larvae. Infection may be direct or indirect through secondary sources, such as food, water, vegetables and fruits since most geohelminth infections are acquired through the faecal-oral route (Nock, Duniya and Galadima, 2003).

Much has been reported on the prevalence of intestinal parasite infection in many parts of Nigeria with the prevalence ranging from 38% - 80% (Idris, 1988; Etim, 1998; Olofintoye and Odaibo 2006). Prevalence has been associated with various factors, such as contamination of the environment with human and animal faeces (Akogun and Badaki, 1998; Adams 2000), polluted water (Luka, Ajogi and Umoh, 2001), poor methods of refuse disposal and personal hygiene (WHO, 1987; Nwosu, 1999) and the low socioeconomic status of the people (Akogun, 1995). In the Warawa Local Government Area of Kano State, there are several Fadama areas and seasonal streams. In the dry season when the wells are dry up, the main source of drinking and bathing water is the stagnant water from the streams, which are infested with snails, such as *Bulinus spp* and *Biomphalaria spp,* which are the intermediate hosts of schistosome (Okuofu and Oniye, 1995). Therefore, the aim of the study is to evaluate the prevalence of geohelminthiasis and *Schistosomiasis* in Warawa towards establishing its status and public health significance for the purpose of control.

Materials and Methods

Samples were collected from the selected school pupils with the informed consent of the council authorities, community leaders, parents, school heads, teachers and the pupils themselves. The name, age and sex of each pupil were obtained from the class register. Each pupil was given a wide-mouth screwed cap sample bottle bearing the serial number that was assigned to the pupil's name in the record books. The pupils were instructed on how to collect their stool into the container between 7 to 10 am.

The faecal samples were preserved with 10% formalin before taken to the laboratory for analyses. Fecal analysis was achieved by using both the direct smear method and the formol-ether concentration technique (Nmorsi, 2009).

A drop of normal saline solution was placed on a clean slide with the aid of a clean dropper. A small quantity (1g) of the faeces was mixed with it, using a glass rod to obtain a thin

smear. Large particles were removed before a cover slip was placed on the smeared slide. A drop of Lugol's iodine was added to the edge of the cover slip and allowed to diffuse into the saline mount. The slide was examined under a light microscope for the presence of geohelminth and *Schistosoma mansoni* eggs or larva using the x40 objective lens. The formol-ether concentration technique was done by placing 2g of the feaces into a test tube containing 10ml of distilled water. This was emulsified and the mixture was strained through a gauze-sieve into a centrifuge tube and centrifuged at approximately 2,500 r.p.m for 3minutes. The supernatant was decanted and 10% formol-saline was added to the tube containing sediments within 2.5mm of the top of the tube and then mixed with a glass rod. About 3ml of ether was added to the mixture in the tube, corked and then shaken vigorously. The mixture was centrifuged again for two minutes at 2,000 r.p.m. after which the fatty debris at the interface of the liquids was loosened with a swab-stick and the whole supernatant fluid together with the debris poured away. A drop of Lugol's iodine solution was added to the deposit at the bottom of the tube and shaken. A drop of the content was pipette into a microscope glass slide under a coverslip and examined under light microscope using the x40 objective lens.

The Results

The descriptive data was analyzed with the standard techniques of mean, standard deviation, frequency counts and percentage.

Simple vicariate analysis using 2 x 2 contingency table analyses with χ^2 was utilized to investigate differences between proportions. Value of $P \leq 0.05$ was considered significant and the data were subsequently analyzed using multiple logistic regression analysis, which adjust for potential confounds. The crude and adjusted odds ratio obtained from the vicariate and multiple logistic regression analyses was presented in 95% confidence intervals. Students t-tests and one way analysis of variance (ANOVA) were used to test mean differences.

Table 1: The Identification and prevalence of geohelminthiasis and Schistosomiasis among pupils

Schools	**Number Examined**	***Schistosoma Mansoni***	**Hookworm**	***Ascaris lumbricoides***	***Strongyloides stercoralis***	**Total**
Gogel	50	26(52.0)	7(14.0)	0	0	33(66.0)
Madari	50	2(4.0)	6(12.0)	1(2.0)	0	9(18.0)
Jigawa	50	0	1(2.0)	1(2.0)	0	2(4.0)
Tokan	50	2(4.0)	0	2(4.0)	0	4(8.0)
Tanburawa	50	1(2.0)	3(6.0)	1(2.0)	1(2.0)	6(12.0)
Tanagar	50	1(2.0)	0	0	0	1 (2.0)
Wakai	50	0	7(14.0)	0	0	7(14.0)
Gumaka	50	4(8.0)	1(2.0)	1(2.0)	1(2.0)	7(14.0)
Katarkawa	50	2(4.0)	1(2.0)	0	0	3(6.0)
Yangizo	50	4(8.0)	9(18.0)	3(6.0)	0	16
Giwaran	50	3(6.0)	1(2.0)	1(2.0)	0	5
Warawa	50	0	0	2(4.0)	0	2
Total	**600**	**45(7.5)**	**36(6.0)**	**12(2.0)**	**2(3.3)**	**95**

χ^2=97.691 df=11 p value=0.000

Table 1 shows the identification and prevalence of geohelminthiasis and schistosomiasis among pupils. The data

obtained from stool samples were analysed statistically using chi-square (χ^2) test. The level of significance was $p< 0.05$. Out of the 600 students examined, 95(15.8%) were infected with at least one species of geohelminth or Schistosomes. This includes *Schistosoma mansoni* with a prevalence of 7.5%, Hookworm with a prevalence of 6.3%, *Ascaris lumbricoides* with a prevalence of 2.0% and *Strongyloides stercoralis* with a prevalence of 3.3%. The overall prevalence for *S. mansoni* was 7.5%. Gogel had the highest prevalence of *Schistosoma mansoni* of (52.0%) followed by Gumaka and Yangizo with a prevalence of (8.0%) each while Tanagar had the least (2.0%). The prevalence of Hookworm was (6.0%). Yangizo and Wakai had the highest prevalence of Hookworm (18.0%) each. Gogel had (14.0%) prevalence while Jigawa, Gumaka, Katarkawa and Giwaran had the least (2.0%) each. The prevalence of *Ascaris lumbricoides* was (2.0%). Yangizo and Warawa had the highest prevalence (6.0%) each, while the least (2.0%) was obtained from Jigawa, Madarin Mata, Gumaka and Giwaran.

Table 2: The Prevalence of Parasite base on age distribution in selected primary schools in Warawa LGA

Age (Year)	Number Examined		Positive	
	No.	%	No.	%
3 – 5	202	33.7	6	3.0
6 – 8	124	20.7	22	17.8
9 – 11	198	33.0	34	17.1
12 – and above	76	12.7	33	43.4
Total	600	100	95	15.8

χ^2=7.831 df=3
p value=0.166

Prevalence based on Age Distribution

Table 2 shows the prevalence base on age distribution. The pupils aged 12 and above years had the highest prevalence (43.4%), Pupils under this age-group play a lot in the sand. Besides, little or no care is given to them; they are allowed to do things on their own (Obiukwu, Umeanaeto, Enenya and Nwaorgu, 2008) unlike their counterparts in the age-group of 3-5 years who had the lowest (2.9%). There was no statistically significant difference (P≤0.05) in prevalence between the various age groups in the selected schools.

Table 3: The prevalence of parasites base on sex of pupils

Sex	Number Examined		Positive	
	No.	%	No.	%
Male	310	51.7	55	**17.7**
Female	290	48.3	40	**13.8**
Total	600	100	95	**15.8**

χ^2=0.645 df=1
p value=0.422

The Prevalence of Infection in Relation to Sex

Table 3 shows the prevalence of infection in relation to sex. The sex specific prevalence showed the highest prevalence in

males (17.7%) than females (13.8%) in the study area (Table 3). There was no statistically significant difference (P>0.5) in prevalence between males and females (Table 3**).** This corroborates other reports (Obiukwu *et al.* 2008; Egwunyenga and Atiku, 2005). They reported that both males and females have the same chances of being infected by these parasites.

Table 4: The Prevalence of Geohelminthiasis and Intestinal Schistosomiasis in Relation to Risk Factors

Risk Factors	No. Examined	No. Positive	%	Odd Ratio
Type of Toilet				
Pit latrine	420	59	14.1	
Water closet	40	26	65.0	
Bush	140	10	.1	1.42
			2.0	
Sources of water				
Stream	209	46	11.9	
Well	311	37	8.8	1.4
Tap	32	6	2.5	
Bore hole	48	6		
Water Contact activities				
Swimming	220	38	7.3	
Fishing	187	40	21.4	1.2
Personal hygiene				
Cutting of finger nails			3.5	
Wearing of shoes	570	77	13.2	
	504	67		0.98
Parents Occupation				1
Civil servants				
Farmers	107	15	4.0	
Traders	378	60	5.9	0.99
	115	20	7.4	

The Prevalence in Relation to Risk Factors

Table 4 shows the prevalence in relation to risk factors. The type of toilet used by the pupils, the source of water for drinking and other domestic use and water contact activities such as swimming and fishing, are well associated with the prevalence of geohelminthiasis and intestinal schistosomiasis in the study area (OR≥1). Personal hygiene and parents occupation had no association with the diseases among the pupils (OR<1).

Discussion of the results

The result of the study demonstrates a high prevalence of intestinal parasites among school pupils in the study area. The high prevalence observed in this study could be due to the fact that a great number of the pupils prefer to defecate in the nearby bush and farms around their school, because their pit latrines were always soiled. It could also be as a result of infection from their home, in line with the studies by Mba and Amadi (2001), as well as Okon and Oku (2001), who reported high prevalence of parasitic infections in the rural setting, pri-urban and urban-slum. Crompton (1999) reported that the high prevalence observed in his study was attributed to poor environment and personal hygiene, shortage of good water supply and indiscriminate defecation. *Schistosoma mansoni* is most prevalent intestinal helminth among pupils in the area. The parasites have been repoted in humans from Kaduna, Adamawa, Niger and Benue States in Nigeria (Idris, 1988,

Akogun and Badaki, 1988 and Nwosu, 1999). Intestinal and helminthic infections are caused by ingesting the cysts, eggs or larval stages of the agent while drinking contaminated water, eating improperly washed or uncooked vegetables irrigated with water or direct contaminated contact with water containing the infective stages, making it impossible for them to penetrate the skin of man (Okuofu and Oniye, 1995: and Fabiyi, 2001). Such exposures are usually enhanced by illiteracy, poor personal and environmental hygiene, which are more prevalent in the study area.

The prevalence of infection among the male pupils (17.7%) was higher than their female (13.8%) counterparts but this was not statistically significant. This could be attributed to the fact that males have fewer restrictions than the females whose leisure hours are strictly controlled. The males are free to swim, play games and work in the farms and gardens than their protected female counterparts. Akogun and Badaki (1998) observed that *schistosomiasis* affected more males than females in a settlement near Yola. Etim (1998) also obtained similar result in Biasie area of Cross River State. The highest prevalence of infection among older pupils compared with the younger is not statistically significant. It could be attributed to the more rigorous activities they involve in, such as fetching water for domestic or school services, playing harder games, gardening etc, which could expose them to infection. These categories of pupils are the seniors in the schools and so are freer. Also at home, they assist in carrying most of the domestic activities. They may, therefore, expose themselves to infection in the home, farms and gardens or within the school environment.

The low prevalence among the younger category of pupils may be attributed to the restrictions imposed on them. Similarly, in the study area, almost all household water comes from the local river, springs and open wells, which are unprotected from the droppings of wild and domestic animals. Furthermore, household waste water is frequently discharged into the local river, which further promotes the transmission of penic intestinal helminths and *Schistosoma mansoni* down river. Generally, the trathogansmission of infection can be during outdoor play with no slippers or shoes on soil contaminated with faeces (Adeoye, Osayemi, Oteniya and Onyemekaihia, 2007). Some of the children might have contacted infection through the ingestion of helminth eggs and schistosoma larve in contaminated food, drinking infected water, eating with or licking unwashed contaminated hands and fingers, clothing or air, especially during outdoor play on the soil (Adeoye *et al*., 2007). A combination of defecating in open spaces, playing on soil and the geophagus habit of the children could be a good source of high helminth infection (Etim and Akpan, 1999). The growth status of the sampled students in general was poor. This could be attributed to poverty, technical underdevelopment, poor sanitation and limited access to health care, education and information, which are common to all developing countries, as

noted by Kightlinger, Seed and Knightlinger (1993) and Johnson (1994).

Conclusion and Recommendations

The prevalence of geohelminthiasis and schistosomiasis among primary school pupils in Warawa Local Government is high (15.8%) and is well associated with *Schistosoma mansoni* and hookworm infection. Age group 12 and above years recorded the highest prevalence. But males and females have equal chances of acquiring the disease because they play on the same ground and most of them eat without washing their hands. The pupils of rural schools harbor more intestinal parasites than their urban counterparts due to differences in the observance of personal and environmental hygiene and access to information.

Recommendations

Since the prevalence of the geohelminth and schistosomiasis is high in the study area, it is recommended that the pupils should enroll in the deworming programme. The World Health Organization has also recommended regular mass treatment for schools where the prevalence of geohelminths infection exceeded 50% (WHO, 2012). In areas where the prevalence of mild to moderate underweight exceeds 25% and where parasites are widespread, high priority should be given to the deworming programme. It is important for a regular deworming programme for the school children to be carried out until such time when the measures taken have reduced the prevalence of geohelminths infection and malnutrition to a low level with the standard of sanitation adequate to prevent transmission and re-occurrence of the infection.

1. There should be public health enlightment campaign on the mode of transmission of the parasite among primary school pupils. It is recommended that as a means of preventing intestinal helminthiasis among the pupils, there should be public education on the need for improved disposal of human and animal feces.

2. There should be proper control of domestic animals living in or around the houses, the observance of good personal and environmental hygiene and the need for the pupils to wear shoes for protection against worm stages that penetrate the skin should be emphasized. Significant efforts should be geared towards improving environmental conditions and the provision of safe and clean water, adequate sanitation and social infrastructure.

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