Prevalence of Intestinal Parasite Among High School Students in Nigeria

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Abstract

A cross-sectional survey was conducted to determine the prevalence of intestinal parasites among students of post primary institutions in two contrasting community in Imo State between March and September 2000. Stool sample were collected from 500 students (250 Urban and 250 Rural). Of the 500 male and female students between the ages of 10 and 26 years examined, 215(43.0%) were found to be infected, using the formal ether concentration method. Four nematodes, Ascaris lumbricoides, Enterobius vermicularis, Trichuris trichura, Hookworm, two cestodes and trematode were encountered during the study. More students in the rural school were infected (46.0%) than in the urban school (40.0%). The difference in infection rates in the two schools was statistically significant (chi-square(x2) =1.000, p>0.05). The most prevalent parasitic helminthes were hookworms (16.0%) and Ascaris lumbricoides (13.4%). Generally, female were more infected 161(53.5%) than males 54(27.1%). The prevalence rates between females and the males were statistically significant at, p>0.05. The prevalence of parasitic helminthes in relation to age, toilet hygiene level and parental occupation were also assessed. Results obtained showed that more students from the rural school were infected while their parental occupation affected the level of prevalence. It was recommended that school based de-worming using albendazole and metronidazole, combined with hygiene promotion and improved sanitation be carried out. Further investigations are needed to determine whether helminthes represents a public health problem.

Keywords: intestinal parasites, helminthes, infections, hygiene and prevalence

1. Introduction

The public health and socio-economic consequences of intestinal helminthes are of considerable global concern particularly in the rural communities of developing countries where malnutrition and other factors complicate the impact of infection. Most parasitological surveys of common parasitic infections in Nigeria have been confined to the rural villages where poor sanitation and domestic

hygiene as well as a general ignorance of the diseases, provide optimal environment for their transmission (Nwosu, 1981). Intestinal parasite or soil transmitted helminthes (STH) are the most common Neglected Tropical Diseases (NTD) world wide which continues to cause significant morbidity in Nigeria and other less developed tropical and subtropical countries. In endemic countries, gastro-intestinal infections are most prevalent in rural communities, peri-urban settings and urban storm (Brooker 2004). Soil transmitted helminthic infections are among the most common infections worldwide and affect the poorest and most deprived communities. They are transmitted by eggs present in human faeces which in turn contaminate soil in areas where sanitation is poor. The main species that infect people are the Nematodes which include the roundworm *(Ascaris lumbricoides)*, the whipworm (Trichuris trichiura), and the hookworms (*Necator Americanus* and *Ancylostoma duodenale), Enterobius Vermicularis and Strongyloides* (Wikipedia 2011). These infections are most prevalent in tropical and subtropical regions of the developing world where adequate water and sanitation facilities are lacking. Other species of intestinal helminthes are not widely prevalent instead; the burden of disease is related to less mortality than to the chronic and insidious effects on health and nutritional status of the host. In addition to their health effects, intestinal helminthic infections also impair physical and mental growth of children, their educational achievement, and also hinder economic development. To this effect, the World Health Organisation (WHO) comes up with the goal to reduce morbidity from helminth infections to such levels that these infections are no longer of public health importance and improve the developmental, functional and intellectual capacity of affected children. (WHO, 1990).

Parasitic nematodes generally belong to the phylum nematoda which consists of worms of relatively simple structure. As a result of the great adaptation shown by nematodes, they have been able to parasitize man, animals including livestock's and plants. Nematodes as a whole are very successful animals and are second to the insects with respect to adaptive radiation. They are found in all possible ecological niches. The intestinal worms do not always require any intermediate host for their transfer to their main host. Man is infected by direct contact with the egg in faeces or through contaminated food, vegetable or water (Mohammed 1980, Roberts and John 1996). The mode of infection varies from one species to another, for instance, *T. Trichiura*, infection occurs when contaminated objects or food is ingested, while in whipworm infection, human faeces are not the source of contamination, but the faeces of carnivores or flesh eating rodents. Eggs of *Capillaria hepatica* have been found in several species of earthworms which are transport hosts that may facilitate infections in normal definitive hosts.

Gastro-intestinal helmintasis constitutes a feeding cause of morbidity. The parasites do not multiply in host, therefore, the intensity and severity of infection depend on the rate and level of initial infection, re infection and super infection. Disease symptoms do not manifest unless the host is heavily infected, hence the lesser emphasis on their importance. The health and socio-economic implications associated with intestinal helminthes are considerable, especially in the rural communities of the developing countries. (Ogbe and Odudu 1988-90). Between five hundred and one million people are estimated to be infected with parasites with direct life cycles (Peters 1978). Although present throughout the world, low standard of sanitation and poor socioeconomic conditions are obvious predisposing factors to high prevalence of helminthes infections in the developing word. (Ogbe and Odudu, 1990). Most Nigerians are suffering from *ascariasis*, while there are several thousands with hookworm, *trichuriasis, enterbiasis, strongylodiasis,* tapeworm infections and other intestinal worms.

2. Epidemiology/ Geographical Distirbution

The world health organization (WHO) estimates that over 1.5 billion people are infected with one or more STHs. Globally, there are 700 million people infected with Hookworm (including 44 million pregnant women), 807 million people infected with ascariasis, and 604 million people infected with

trichuriasis (WHO,1990). Transmission mainly occurs in tropical climates and where sanitation and hygiene are poor. There is variation in epidemiology that is, the occurrence and the method by which the worms are acquired and spread. *A. lumbricoides* has a World-wide distribution, being especially prevalent in the tropics among malnourished people residing in the developing countries being at higher risk. Areas with modern water supply and waste treatment facilities have low incidence or infection with the parasite. *A. lumbricoide* eggs are destroyed in the environment by sunlight, desiccation pathogens and predators. However, it is not unusual to find at least 100 eggs in 1g of soil from an area of endemic ascariasis (Onadeko 1989). Also prevalent in the tropics are *strongyloides spp.* which occur in the tropical regions of Africa, Asia and South America. On the other hand, *Enterobuis nermiculars* and *Trichuris trichiura* are cosmopolitan in distribution. *E. nermiculars* is more common in temperate regions became of less frequent bathing and changing of underclothing, but *T. trichiura* occurs more in worm, moist regions of the World (Bethonys, 2006).

Several epidemiological studies have been carried out in rural and urban areas of Nigeria on the prevalence and intensity of intestinal helminthes. According to the work by Mafiana, (1995) *Ascaris lumbricoides, Trichuris, trichiura* and hookworm are most common. The major effect of these worms is morbidity rather than mortality and the morbidity effect is particularly most severe on children because of the heavy infection they harbor and because of their vulnerability to nutritional deficiencies. Hence extensive field investigations to locate the foci and determine patterns of transmission of intestinal parasites are very necessary for primary health care system in Nigeria. However, epidemiological data are sparse for most developing countries and the incidence of parasites can vary widely even in small areas (Heinz 1968) and between the rainy season and dry seasons. Edungbola, (1988-90) estimated that about fifteen million Nigerians are suffering from *ascariasis* alone, while there are several thousand with hookworm, *trichuriasis, enterobiasis, strongyloidiasis*, tapeworm and other helminthic infections. Apparently, the epidemiology of human intestinal parasites is vastly recorded in Nigeria. In most cases hospitals records have become an increasingly popular method of determining prevalence of these diseases (Agugua N.E.N, 1983; Reinthaler et al, 1988).in addition, reports by Brooker et al, (2004) showed that larval stages of hookworm and *strongyloides* are found under the skin and in the lung during their migratory stages. Similarly, investigations by Crompton D.W.,(2001) revealed that adult *Ascaris* normally lives in the small intestine of the host where it feeds on the semi digested food, of the host, but there is evidence that it more frequently bites the mucus membrane with its lips and sucks blood and tissue juices to some extent.

3. Transmission/Life Cycle

Intestinal worms are parasitic worms that are generally contracted either through ingesting parasite eggs or larva or direct penetration while walking barefooted on contaminated soil. Adult nematodes inhabit the gastro-intestinal tract. Eggs produced by the female are passed out in faeces. The eggs embryonate and hatch into first stage larvae (L1) which in turn moult into second stage larvae (L2). The L2 larvae moult into third stage larvae (L3), but retain the cuticle from the previous moult. This double-cuticle (L3) is the infective stage. The time required for the eggs to develop into infective larvae depends on temperature. Under optimal conditions (high humidity and warm temperature), the developmental process requires about 7 to 10 days, but in cooler temperature the process may be prolonged. Ruminants are infected by ingesting the L3. Most larvae are picked up during grazing and pass to the abomasums, or intestine, ex-sheathing the extra cuticle in the process. In some groups such as *Trichostrongyle* the L3 penetrates the mucous membrane. During the next few days the L3 moults to the fourth stage (L4) and remain in the mucous membrane or in the gastric glands, for 10 to 14 days. They then emerge and moult into mature adults which start egg production about 3 weeks after infection. The period between the infection of an animal by ingestion of infective L3 larvae and the first egg production by the adult

female parasite is called prepatent period. This period is different for different species of parasites (wikipedia, 2011).

4. Symptoms

Though symptoms vary, they include anemia, malnutrition, and vitamin A deficiency, swelling of the abdomen, weight loss, diarrhea, and inflammation of the intestine. The most serious complications are intestinal obstruction, usually of the small intestine. Pulmonary symptoms occur in a small percentage when *ascaris* larvae pass through the lungs. *Trichuris* infection can cause blood loss as well as dysentery and rectal prolapse. However, travelers are almost never at risk of these more severe manifestations of intestinal helminthes.

5. Diagnosis, Treatment and Control

The standard method of diagnosing STHs infection is by identifying the parasites eggs in faeces under a microscope. Adult *Ascaris* worm may occasionally be coughed out/up or found in stool or vomit. Treatment is achieved using oral drugs. The drugs available are albendazole and mebendazole which are easy to administer by non-medical personnel. They are donated by Glaxo Smith Kline and Johnson and Johnson for STH control programs. They are administered either once or twice a year depending on the prevalence of infection. The aim of WHO control strategy is to reduce morbidity caused by the disease by periodically treating all populations at risk including pre-school children, school age children, women of child bearing age pregnant women in their second and third trimesters, and breastfeeding women, as well as adults in certain high-risk occupations. To break the cycle of transmission, it is essential that STH treatment efforts be accompanied by health and hygiene education that encourage healthy behaviors, sanitation and simple hand washing to prevent transmission.

6. Materials and Method

6.1 The Study Area and Population

The study area comprised Owerri Municipal and mbaitoli Council Area, both in Imo State, Eastern Nigeria. Owerri is the capital of Imo State and the seat of administration with social amenities like water, electricity, good road network, hospitals, schools and good sanitation program. On the other hand, Mbaitoli is a rural Council area where there are inadequate provision of social amenities and infrastructural development. Two secondary schools were chosen randomly and used for the study, one from each Council Area. The schools are development secondary school in Owerri municipal council and Umunaoha comprehensive secondary school in Mbaitoli local government area. In Development secondary school the students are almost living within Owerri capital, their parents and guardians are mostly civil servants, business men and women. In contrast Umunaoha Comprehensive secondary school is more than 20 kilometers from Owerri capital. The natives engage in occupations like farming, driving, clay mining and molding as well as leather works. The study population comprised all the students of the selected schools while the sample size was 500 students drawn randomly from the two schools (250 from each school).

6.2 Study Design

The study was an experimental research and the detailed methodology included questionnaire administration to students, collection and analysis of samples. One week prior to and questionnaire administration and parasitological surveys, a written informed consent for the parents/guardian of participating children was sought. Copies of the questionnaire and small plastic containers for

collection of stool sample were left with the teachers for distribution to selected children. During the school based survey, the signed informed consent sheets, and stool samples were collected. A short interview was held with each child, using a questionnaire pertaining to hygiene behavior, source of drinking water and general sanitation based on the standard tool provided by joint monitoring programmed of WHO and UNICEF. The school principal with the member of staff helped to organize the students for effective sampling.

6.3 Procedure for Sample Analysis

The main method was the formal ether techniques in which parasites are sediment by centrifugal force. The formal ether concentration method described by king (1979) was closely followed for laboratory examination of stool specimens. 0.5gm of faecal matter taken in a test tube was dissolved in some amount of normal saline solution which acts as a clearing agent. The solution was sieved with a trainer to remove large particles. They sieved suspension was collected in a beaker and then transferred into a centrifuging tube, centrifuged for 5mins at 3000rpm. A sterile rod was then used to loosen the layer of faecal debris from the sides of the tube which was rapidly inverted to discard the ether, faecal debris and formal water. The sediment was then mixed with the sterile rod, transferred to a slide and covered with a cover slip. The entire preparation was then examined microscopically using x10 objective with the condenser iris closed sufficiently to give good contrast. The number of each of parasite's ova in the entire preparation was counted and then multiplied by 2 to give the approximate number of each parasite per gram faeces.

6.4 Statistical Analysis

Simple percentages and chi-square (x^2) test were used to analyze the results obtained from sample analysis and p=0.05 was taken as the acceptable level of significance (df=1, p=0.05). the statistical methods were used in other to provide a clear deviations between observed and expected values and a test of significance which are important in decision making.

7. Results

Helminth eggs were prevalence in 219 (43.8%) (Table 1). Four nematode eggs namely; Hookworm (16.0%), *Ascaris lumbricodes* (13.4%), *Trichuis trichiura* (2.8%) and *strongloides stercoalis* (3.6%) were encountered. Two cestode ova namely Taenia sp (3.2%) and *Hymenolepis nana* (1.6%), and only a trematod ovum *schistosoma, mansoni* (2.4%) were encountered during the study. From the distribution patterns of helminth parasites encountered during the study, more students were infected (46.0%) in the rural school (Umunaoha Comprehensive Secondary School) than in the urban school (Development Secondary School) (40.0%). Prevalence of helminth parasites varied among various age groups with an initial increase (33.3%) in the > 10 age groups peaked in the 16-20 age groups (49.4%) before a gradual decrease as the age increased (table 1). Although prevalence varied among the various parental occupations with farmers having the highest value, (66%), followed by fishermen (53.0%) and housewives as the least 31.5% (table 2). There was no difference in prevalence rate as it relates to the parental occupation of the sampled students (p>0.05). Helminth infection was also satisfied according to type of toilet facilities used. It was observed that 16.8% of the students in the rural area defecate in the bush, 14.8% use pit latrine, while 11.4% use water closet while the bucket system was found to be no longer in existence. As expected, those who defecate in the bush harbored more parasites especially nematodes (16.8%) than any other of toilet system. On sex related prevalence, 54 of the 199 (27.1%) males had infection while (53.5%) of 161 females were infected table 4. A chi- square analysis showed that there is a significant variation in prevalence rates among sexes (p.0.05).

E-ISSN 2281-4612
ISSN 2281-3993

Academic Journal of Interdisciplinary Studies

MCSER Publishing, Rome-Italy

Vol 2 No 7

September 2013

Table 1: Prevalence of helminth infection in relation to age in the two schools (Positive for helminth parasite) n= 500

Age (years)	No. examined	(%) Hookworm	(%) Ascaris lumbricoides	(%) Trichuris trichiura	(%) Strongloides Stercoalis	(%) Schistosoma mansomi	(%) Taenia sp	(%) Hymenolepis nana	Total No (%)
< 10	93	12(12.9)	8(8.6)	1(1.1)	4(4.3)	1(1.1)	2(2.2)	4(4.3)	32(34.4)
11 – 15	179	39(21.8)	20(11.2)	4(2.2)	3(1.7)	3(1.7)	4(2.2)	2(1.1)	77(41.3)
16 -20	172	26(15.1)	35(20.4)	5(2.9)	5(3.5)	4(2.3)	7(4.1)	2(0)	84(49.4)
21 -25	47	3(6.1)	3(6.4)	6(12.8)	5(10.6)	3(6.4)	1(2.1)	0(0)	21(44.7)
26 +	9	0(0)	1(11.1)	2(22.2)	1(11.1)	1(11.1)	2(22.2)	0(0)	5(44.4)
Total	500	80(16.0)	67(13.4)	18(3.6)	18(3.6)	12(2.4)	16(3.2)	8(1.6)	219(43.8)

Table 2: Prevalence of parasitic infection in relation to parental occupation

Parents Occupation	Total No. examined	No. Infected	% Infected
Civil servant	180	46	42.5
Farmers	94	62	66.0
Business Men	136	52	32.2
Fisher men	19	10	53.0
House wives	143	45	31.5
Total	**500**	**215**	**43.4**

Table 3: Prevalence of Helminth infection in relation to type of toilet facilities used

Toilet facilities	Number examined	Total No. infected	(%) of infected
Bush	100	84	(16.8)
Pit toilet	100	74	(14.8)
Bucket	0	0	(0)
Water closet	300	57	(11.4)
Total	**500**	**215**	**(43.0)**

Table 4: Overall sex-related prevalence of helminth parasites encountered during the study.

Sex	No. Examined	No. Infected	% Infected
Male	199	54	27.1
Female	301	161	53.5
Total	**500**	**215**	**43.4**

8. Discussion

The result of this study have demonstrated the existence of seven different helminth parasites among students of two contrasting post primary schools within Imo – States, Eastern Nigeria. It also indicates that hookworms and *lumbricoides* were more prevalent in the areas under study. The results agree with those of Nwosu (1981). Onwuliri, C.O.E and Anosike,J.C (1993), and Agugua, N.E.N (1993) who reported that these parasites, particularly hookworms and *Ascaris* are common throughout Nigeria. The relatively high prevalence of helminthes (43.0%) observed here conforms to previous findings in Eastern Nigeria (Nwosu and Anya 1980). The variation in prevalence rate of intestinal helminthiasis in different rural and urban areas could be related to several factors including people's level of education, standard of personal/environmental hygiene as well as social habits.

In most surveys in Nigeria, no attempt has been made to distinguish between the two types

E-ISSN 2281-4612
ISSN 2281-3993

Academic Journal of Interdisciplinary Studies
MCSER Publishing, Rome-Italy

Vol 2 No 7
September 2013

of human hookworm infections. However, recent evidence has shown that two common species of hookworm in several parts of Nigeria are *Necator americanus* and *Ancylostoma*. The habit of defecating in the bush coupled with the eating of contaminated fresh fruits and vegetables with equally contaminated and unwashed hands by these students are the principal sources of infection, since Ascaris is acquired by ingestion of embryonated eggs. Similarly, hookworm infection occurs mainly through perscutaneous route. Most students especially those from the rural schools examined seldom put on foot – wears and this could explain the high prevalence of hookworm infection. This, assertion is corroborated by the report in Wikipedia (2011) which has it that infective larvae penetrate the skin and gain access to the host.

Students below 20 years of age are mostly affected with helminth parasites. This could be as a result of their constant exposure to contaminated areas during defaecation in the bush, use off barefoot and poor hygiene. This agrees with the report of Aguga (1993), Obiamiwe (1991), who found out that student whose parents are farmers and fishermen exhibit low level of personal hygiene. Furthermore earlier investigators in Nigeria, Agugua (1983) Obinmiwe (1991), found out that males were exposed to the infection stages of helminthes as their females' counterpart, indicating that both sexes were naturally equally exposed to parasitic infection. In contrast to the present work, revealed that infection was significantly higher in females than in males. Apart from the difference in number of students, the reason for the higher prevalence in females could be attributed to their involvement in domestic work, farming activities.

9. Recommendations

The gastro-intestinal tract of a child living in poverty in a less developed country is likely to be parasitized with at least one, and in many cases all the three soils- transmitted helminthes, with resultant impairments in physical, intellectual, and cognitive development. Therefore the following recommendations are made.

- In view of morbidity and medical complications of helminthiasis, free medical tests and periodic de-worming of students with benzimidazole antlhelmintics, mebendazole,and albendazole should be carried and sustained to remove these infections in schools.
- That environmental sanitation and personal hygiene programmes be introduced to schools and communities, and sanitation laws be enacted and enforced on all citizens to curb the transmission and spread of helminthic diseases.
- That public enlightenment and school health services be extended to primary and post-primary schools in the state to create awareness on the occurrence, mode of infection and the health impacts of helminthic parasites. This calls for a synergy between the ministries of Education and Health.
- That more emphasis be laid on developing control and preventive measures rather than treatment, to reduce the occurrence and transmission of the diseases.

10. Conclusion

Prevalence of intestinal parasitic helminthes is World wide but more common in developing countries as a result of poor sanitation, ignorance, poverty and malnutrition. In developing countries, the rural populace is more at risk than the urban due to inadequate provision of social amenities and poor infrastructural development. Helmenthic infections are among the Neglected Tropical Diseases which have resulted to morbidity and mortality, and their control and prevention are one of the major challenges facing Nigeria and other developing countries of the World. The improvement of general standard of sanitation through the installation of suitable waste management and disposal facilities, and provision of pipe – borne water supply are important pre-requisites for successful prevention and control of helminthic infections in Imo State. Thus treatment, mass chemotherapy directed at school children will be a step in the right direction. More

so, with the improvement in the standard of environmental hygiene and their social habits, health problems regarding helminthes infections in the study area in particular and Imo State generally could gradually be brought under control. The school teachers have a tremendous role to play in order to change this present situation.

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