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The prevalence of geohelminth eggs in cattle markets and botanical gardens in Benin City, Nigeria

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ABSTRACT: The prevalence of geohelminth eggs was conducted in six cattle markets and three botanical gardens in four local government areas, in Benin City, Edo state, Nigeria. Of the 180 soil samples examined using the test tube floatation method, 47.7% of the samples were positive for helminth eggs. *Ascaris lumbricoides* had a prevalence of (21.8%), *Trichuris trichuira* (6.1%) and hook worm (20.4%), *Fasciola gigantica* (10.2%), *Taenia sp* (1.4%), *Toxocara canis* (22.5%), *Schistosoma bovis* (3.4%) *Stronglyloides stercoralis* (10.9%), *Sygamus trachea* (1.4%) and *Heterakis* species (2.0%), were recovered from the soils. These results indicate that the soils of Benin are contaminated and also suggest a vicious cycle of pollution by humans and domestic animals. Improving environmental sanitation by encouraging proper sewage disposal and treatment, good animal husbandry practice and public health enlightenment is imperative for the control of soil transmitted helminthiasis in Benin City.

Key Words**:** Geohelminth eggs, Prevalence, Cattle markets, Botanical gardens.

Introduction

Soil-transmitted helminthiasis otherwise known as geohelminthiasis is caused by a group of helminth parasites with an essential part of their life cycle in the soil. There is a period of persistence in the soil during which the infective stages are protected and preserved. The global distribution of these intestinal parasites and the diseases they cause have been documented by many authors, and the global prevalence depends not so much on the regional ecological conditions but more on the local standards of hygiene, social and economic development of the people (1).

There are about twenty major helminth infections of man and animals and all have some public health significance. But among the commonest is the geohelminthiasis. WHO estimates that almost 2 billion people are infected with one or more of these soil transmitted helminthes accounting for up to 40% of the global morbidity from infectious diseases, exclusive of malaria (2).

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Recent global estimates indicate that more than a quarter of the world's population is infected with one or more. The most common of these parasites are the round worm, *Ascaris lumbricoides*, the hookworm, *Necator americanus* and *Ancylostoma duodenuale*, and the whipworm, *Trichuris trichuira* (3). Furthermore, the most serious soil-transmitted helminth infections of man and animals are acquired in tropical and subtropical areas with poor sanitation, but some also occur in the developed world.

Geohelminthiasis is promoted by poor hygiene habits such as indiscriminate disposal of human and animal faeces (4,5). This habit permits contact of faeces and its accompanying microbial load, including geohelminths eggs, with soil. Soil is therefore an important vehicle for development and transmission of geohelminth eggs. In Nigeria, a considerable amount of human and animal waste is discharged into the soil daily because of poor sanitation and poor animal husbandry practices, leading to the seeding of the soil with pathogenic organisms including geohelminth eggs and larvae. Eggs in soil become the main source of infection particularly to children (6,7). Infection may be transmitted directly or indirectly through secondary sources such as food, water, vegetables and fruits (8,9). The major parasitic diseases caused by helminthes in livestock in tropical Africa include fascioliasis caused by *Fasciola gigantica*, taeniasis and cysticercosis caused by *Taenia solium* or *T. saginata*. Quite apart from the direct economic losses resulting from the effects of these diseases, they are important to man because they are zoonotic diseases. A wide variety of Parasites and their eggs are present in sewage and feaces which are eventually washed along with runoff water after the rains traveling long distances, (7). The indiscriminate spread of cow dung due to preponderance of cattle markets and the use of animal faeces in Botanical garden are known to increase the level of soil contamination with geohelminth eggs. This has, however, not been investigated in Benin City. This study was carried out to examine the level of soil contamination as a result of location of cattle markets and Botanical gardens in Benin City.

Materials and Methods

Study Area

The study was carried out in four Local Government Areas (LGA) in Benin City, capital of Edo State. Benin City lies between latitude $6^{o}17'$ and $6^{o}26'$N and longitude $5^{o}55'$ and $5^{o}41'$E. It lies in the rainforest and is characterized by an annual rainfall of 1850mm-2445mm and temperature range between 30.0^{o}C-36.5^{o}C. The soil is invariably compact laterite which becomes flooded after heavy rains. The topography is fairly flat with few hills to the east and north east. The city is 78m above sea level.

The climate of Benin City is tropical with high temperature and heavy rainfall for most part of the year. The study was conducted between August to October 2004. Benin is well known for housing the renowned University of Benin. Heaps of refuse and poor drainages are common features in the city center while animal husbandry is poor which has led to increased soil contamination by feaces of these animals and even man. The soil is therefore an important vehicle for transmission of geohelminth eggs.

Six cattle markets namely – Evbotubu, Ekenwan, Benin Technical school Road (Ugbowo), Aduwawa, Eyaen and Ahor cattle markets and three botanical gardens – located by University of Benin Ekenwan and Ugbowo Campuses and opposite Church of God Mission, by Airport Road in Benin City were chosen for this study, one of the cattle markets was located in the outskirts of Benin while the others were located within residential areas in the city. Two of the botanical gardens are located within the city centre while one is located in the outskirts of the city close to the university.

Collection and Examination of Soil Samples

Ten soil samples were collected from the cattle markets and another ten soil samples was collected from the immediate environment bringing the total to twenty samples collected from each of the cattle markets visited. The same method of collection was also carried out for each of the three botanical gardens visited. A total of 180 samples were collected.

Soil samples were examined in the laboratory using test tube floatation method (10), saturated solution of sodium chloride (brine) was used as floatation solution for the examination of helminth eggs in soil samples.

Five grams of soil sample was put into a test tube and distilled water added, the soil was broken up and mixed with a wooden stick. The resulting suspension was then strained out the process was repeated until supernatant was clean. The clean supernatant was decanted and sufficient brine (floatation solution) was added up to the brim of the test tube and allowed to stand for about 10-20 minutes. The cover slip was carefully lifted and placed immediately on a slide and viewed under the microscope. Eggs of geohelminths observed were identified as described by Theinpont (10) and Soulsby (11).

Results

Of the 180 soil samples examined from the cattle markets and botanical gardens and their immediate environs, 86 (47.7%) had helminth (ova) eggs. The ova were those of *Ascaris lumbricoides*, 32, (21.8%) *Trichuris trichuira* 9 (6.1%), hook worms 30, (22.5%), *Taenia* 2, (1.4%), *Toxocara canis* 33, (22.5%), Schistosoma bovis 5, (3.4%), *Strongloides stercoralis* 16, (10.9%), *Syngamus trachea* 2, (1.4%) and *Heterakis* Sp 3, (2.0%). (Table 1).

The prevalence of eggs in soil with respect to the sites of sample collection is shown in Table 2. Cattle markets 23, (38.3%), environs 26, (43.3%) botanical gardens 21, (70.0%) and in the immediate environments 16, (53.3%). From the results, obtained the prevalence of eggs from the cattle market was less than its immediate environment while in the botanical garden it was the reverse.

Toxocara sp eggs were significantly high, in this survey closely followed by *Ascaris* and hookworm eggs compared to low egg prevalence for the other helminthes. The results for all the samples examined for soil transmitted helminth eggs is shown in Tables 1 to 3. Table 3 comprises of summary of the result obtained in this study.

Table 1: Frequency distribution of parasite ova recovered

Parasite species	Number of eggs (%)
Ascaris lumbricoides	32 (21.7)
Trichuris trichuira	9 (6.0)
Hookworms	30 (20.1)
Fasciola gigantica	15 (10.1)
Taenia Sp.	3 (2.0)
Schistosoma bovis	5 (3.3)
Toxocara canis	33 (22.2)
Syngamus trachea	2 (1.4)
Heterakis Sp	3 (2.0)
Total No. of ova	**148**

Table 2: The prevalence of eggs in soil with respect to site of sample collection.

Place	No. of sample examined	No positive (%)
All cattle markets	60	23 (38.3)
Cattle market Environs	60	26 (43.3)
All botanical gardens	30	21 (70.0)
Botanical garden Environs	30	16 (53.3)
Total	**180**	**86 (47.7)**

Discussion

This study showed that the geohelminth eggs content of Benin City soil is significantly high and consist of *Ascaris, Toxocara*, hookworms, *Stronglyloides, Taenia, Fasciola, Schistosoma, Syngamus* and *Heterakis* species to a level of 47.7%. The fact that the adult stages of these worms reside in the intestine of man and domestic animals, the presence of the eggs in the soil is indicative of faecal pollution.

The rate of contamination of the environment by nomadic cattle has increased with the serious implication for zoonotic bovine infections like fascioliasis. Furthermore free-range dogs contaminate the environment with their faeces and there is also poor sewage disposal. There are no public toilets and this is often associated with open air defecation.

The eggs of helminth parasites of man and domestic animals encountered during the study have been reported elsewhere in Nigeria, thus suggesting wide epidemiological distribution of these species. Eneanya and Njom (1) also established that night soil used as fertilizers in farms in Enugu, Nigeria contaminated fruits and vegetables sold in markets. A similar study in Makurdi was carried out and they found that of the 185 samples examined, 68 (36.7%) were positive for *Toxocara canis* eggs (11) In this study, in Benin City it was found that indiscriminate disposal of refuse and sewage contaminate the soils. This has been further enhanced by the location of Botanical garden and cattle markets indiscriminately in city centers. Of the 180 samples examined in this study, 47.7% of the samples were positive for geohelminth eggs. This result is comparable to 36.7% observed by Omudu (11) in Benue State and lower than 60% reported for soils in Anantigha, a peri-urban settlement on the outskirts of Calabar Cross Rivers State (7). Muttalib *et al* (13) reported that 80-90% of human excreta found its way into soil, refuse dumps, gardens and water sources were found to be infected in Bangladesh, predominantly by *Ascaris* eggs.

Fueki (14) established that night soil is widely used as fertilizers in rural areas in Japan and that nearly half of the vegetables sold in markets are contaminated with *Ascaris* eggs. The presence of helminth eggs in the soil, in this study, is of public health concern given the level of egg prevalence (47.7%) of geohelminths found.

Helminthiasis in children is a serious health problem. For instance hookworm infection leads to decreased productivity, reduced rate of cognitive development, poor performance at school. *Ascaris lumbricoides* is the largest intestinal helminthes parasite of man and ascariasis is the commonest parasitic infection in the world (15). *Trichuris trichuira*, a geohelminth is known to cause stunted growth (3), while *Strongyloides stercoralis* is a pathogen of major importance because of its ability to remain as a low grade infections in immunocompromised patients which is often fatal. It has also been identified as a Zoonotic infection with non human primates and dogs being naturally infected. (Although the prevalence of *Strongyloides stercoralis* in this study is low 16, (10,9%), yet it deserves greater attention due to the fact that parasite shows persistence in the environment.) Other species which are of veterinary importance to animals and man are *F. gigantica, Taenia,sp., Schistosoma bovis, Heterakis sp*. and *Toxocara canis.*

Table 3: Results of Samples Examined for Soil Transmitted Helminth Eggs.

Sites of sample collection	No. of samples examples	No. of sample positive (%)	Percentage Prevalence of helminth eggs (%)										
CATTLE MARKETS			*Ascaris*	*Trichuris*	Hookworms	*Toxocara*	*Fasciola*	*Taenia*	*Schistosoma*	*Stronglyoides*	*Synganmus sp*	Heterakis sp	Total
ADUWAWA	20	10(50)	1(0.7)	1(0.7)	3(2.0)	3(2.0)	2(1.3)	1(0.7)	1(0.7)	3(2.0)	-	-	15(10.1)
EVBOTUBU	20	8(40)	4(2.7)	1(0.7)	1(0.7)	1(0.7)	1(0.7)	-	2(1.3)	1(0.7)	-	-	11(7.4)
AHOR	20	8(40)	6(40)	-	4(2.7)	3(2.0)	2(1.3)	-	1(0.7)	3(2.0)	-	-	19(12.9)
EYEAN	20	2(20)	-	-	2(1.3)	-	1(0.7)	-	1(0.7)	-	-	-	4(2.7)
EKENWAN	20	7(35)	3(2.0)	1(0.7)	3(2.0)	1(0.7)	-	-	-		-		
BENIN TECHNICAL COLLEGE ROAD.	20	10(0.7)	1(0.7)	1(0.7)	1(0.7)	3(2.0)	1(0.7)	-	-	2(1.3)	-	-	12(8.1)
BOTANICAL GARDENS													
EKENWAN ROAD	20	11(55)	4(2.7)	1(0.7)	5(3.3)	6(4.0)	-	1(0.7)	-	1(0.7)	1(0.7)	-	19(12.9)
AIRPORT ROAD	20	13(65)	8(5.4)	4(2.7)	3(2.0)	8(5.4)	1(0.7)	-	-	3(2.0)	1(0.7)	2(1.3)	30(20.2)
UGBOWO BY UNIBEN	20	13(65)	5(3.3)	-	8(5.4)	5(3.3)	4(2.7)	-	-	2(1.3)	-	1(0.7)	25(16.9)
TOTAL	180	86(47.7)	32(217)	9(6.0)	30(20.2)	33(22.2)	15(10.1)	3(2.0)	5(3.3)	16(10.7)	*2(1.3)*	3(2.0)	148

This study confirms the level of pollution of helminth eggs in the soils of Benin City, with eggs of *Toxocara canis* having the highest prevalence. Work by Ajayi and Duhlinska (16), Edosomwan and Aghanti (17), also showed the high prevalence of *Toxocara* eggs in Nigeria. These findings suggest widespread epidemiological distribution and large-scale environmental contamination of soil with *Tococara canis* by stray dogs.

In conclusion, effective health education programme should re-emphasize the need for composing of human night soil and animal dung before their use as fertilizers. The movement of cattle from place to place for grazing by nomadic cattle rearers should be discouraged. It has often been advocated that education on good hygiene habits especially against indiscriminate disposal of faeces be accompanied by legislations and its accompanying enforcement towards having and sustaining a clean and intestinal parasite free environment.

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