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Prevalence of Geohelminths Ova in Soils of Selected Public Primary School Premises in Benin City, South-South, Nigeria.

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Abstract
Geohelminths infection has been increasingly recognized as an important Public Health problem especially in developing countries. Different species of geohelminths infect children in tropical and subtropical parts of the developing world; the commonest are Ascaris lumbricoides, Trichuris trichiura, Hookworms and Strongyloides stercoralis. Two hundred and forty soil samples were collected from the premises of eight primary schools in Benin City. In each Primary School, thirty samples of 20g each of top soil were scooped from Classrooms, Toilet areas and Playground into polythene bags for analysis. Floatation method was adopted with saturated sodium chloride (NaCl) solution for the detection of geohelminths ova. The overall prevalence of geohelminths ova was 62(25.8%). Ascaris lumbricoides had the highest prevalence 51(60.7%), T. trichiura 12(14.3%), Hookworm 16(19%) and S. stercoralis 6(7.1%). The prevalence of ova regarding sample sites was: Playground, 12(14.3%), Toilet area 46(54.7%), Classroom area 26(30.90%). The distribution of ova in soil with respect to schools was; Estate Primary School 7(23.3%), Ekosodin Primary School 7(23.3%), Ugbowo Primary School 7(23.3%), Olua Primary School 8(26.7%), Idunowina Primary School 9(30.0%), Edaiken Primary School 11(36.7%), Okhoro Primary School 6(20.05) and Isiohor Primary School 9(30.0%). The results revealed a significant difference ($p<0.05$) in the prevalence of geohelminths ova in the various sites. The toilet area had the highest prevalence while the playground recorded the lowest. Therefore, there is need for proper sanitation in these locations especially the toilet areas.

Keywords: School, Prevalence, Geohelminths, *Ascaris lumbricoides, Trichuris trichiura*

Introduction
Geohelminths, also referred to as Soil Transmitted Helminths (STHs), infections are among the most common infections worldwide [1, 2]. The high prevalence of geohelminth infections is closely correlated with poverty, poor environmental hygiene, impoverished health services, lack of better housing and clean water [3, 4 and 5]. This infection is more prevalent in tropical and subtropical regions, including sub-Sahara Africa and its public health importance has been demonstrated by a number of studies both in Nigeria [6, 7 and 8] and other parts of the world [9, 10 and 11]. World Health Organization (WHO) estimated that more than one billion of the world's population is chronically infected with STHs [9]. Estimates by WHO show that about 3.5 billion are affected with intestinal parasitic infections, the majority being children [12] and they tend to occur in high intensity in children [9, 13].
Clinical manifestations of STH infection include malnutrition, intestinal abnormalities, rectal prolapse, respiratory complications, stunted growth, poor weight gain, chronic intestinal blood loss in school age children, poor absorption or increased loss of nutrient, which may result in protein-energy malnutrition and anaemia (14, 15, 16 and 17]. Besides, STH infection hinders cognitive abilities and academic performances, causes intellectual retardation in children and reduces productivity [18, 19].
Global estimated prevalence of anaemia in hookworm infection and a cognitive improvement of deficit in hookworm, *Ascaris* and *Trichuris* infections indicate that for each parasite, 10-50 million persons may be affected [20]. In Nigeria, numerous surveys have been carried out over the years in different parts of the country on the prevalence of intestinal parasites among many groups of people. Most of these reports blamed the prevalence and intensity of parasitism on low level of sanitation, domestic hygiene, abject poverty, and illiteracy because such studies are concentrated among children and rural inhabitants. There is paucity of information on the prevalence of STH in soils of primary schools, as most of the previous studies have been only on stool samples. This study was therefore carried out to determine the prevalence of geoheLominth ova in soils of the premises of selected public primary schools in Benin City, South-South, Nigeria.

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Materials and Methods

Study area

The study was conducted in Benin City and its suburb. The study locations included 8 primary schools which were randomly selected. They include: Estate primary school, Ugbowo; Ekosodin primary school, Ekosodin; Ugbowo primary school, Uwasota; Olua primary school, Uselu; Idunowina primary school, Idunowina; Edaiken primary school, Uselu; Okhoro primary school, Okhoro and Isiohor primary school, lsiohor. Benin City lies between latitude 6°17′ and 6°21′ North and longitudes 5°35′ and 5°41′ East. Benin City metropolis is predominantly a mixture of people from different ethnic groups in Nigeria, although the majority is the Benin speaking people of Edo State and it is a community with a mixture of traders, transport workers, farmers, artisans, and civil servants. The city lies within the tropical rain forest zone of Nigeria and has the characteristic wet and dry seasons. Temperature ranges between 30-36.5 °C in the peak of the rainy season and relative humidity is about 75% maximum but drops to 50-55% during the dry season [21].

Ethical approval

Ethical approval was obtained from heads of the 8 schools in Benin City selected for this study. Verbal consent was also obtained from them.

Collection of soil samples

The present study was conducted from January-June 2010. A total of two hundred and forty (240) soil samples were collected and screened for geohelminth parasitic infection from the premises of the primary schools. Thirty (30) soil samples were collected in each primary school. Twenty gram (20g) of top soil of about 2cm were collected each from the classroom, toilet areas and playground, and scooped into polythene bags for analysis.

Examination of soil samples

Test tube floatation method was adopted with saturated sodium chloride (NaCl) solution (Nock *et al.*, 2003). Two gram (2g) of each sample was placed in a test tube and distilled water was added. The soil was broken up, mixed and stirred vigorously using a spatula for 1 min. The supernatant was decanted and the test tube refilled with water. The process was repeated until the supernatant was clear. The supernatant was then discarded and the floatation solution was added to the soil. A cover slip was carefully placed over the top of the test tube to make contact with the brim and it was allowed to stand for 10 to 20 min. The cover slip was thereafter, carefully removed and the wet surface placed against the surface of a glass slide for microscopic examination. Eggs of geohelminths observed were identified using keys and descriptions by [22, 23].

Data analysis

The results of the prevalence of eggs/ova in soil with respect to sample sites were subjected to Chi-square test using SPSS Version 16.

Results

The overall prevalence of geohelminths egg was 62 (25.8%) out of the 240 soil samples collected from the eight primary schools. This was distributed as follows; eggs of *Ascaris lumbricoides* 50 (59.52%), eggs of *Trichuris trichiura* 12 (14.29%), eggs of Hookworms 16 (19.05%) [*Ancylostoma duodenale* 10 (11.91%) and *Necator americanus* 6 (7.14%)] and larvae of *Strongyloides stercoralis* 6 (7.14%).

The prevalence of geohelminths eggs/ova in soil with respect to sample site was; playground 12 (14.29%), toilet area 46 (54.76%) and along classroom 26 (30.95%). There was a significant difference in the prevalence of geohelminth eggs in the different sampled sites ($P < 0.05$) with toilet areas having the highest prevalence.

The distribution of eggs/ova in soil with respect to schools were as follows; Estate primary school 7 (23.2%), Ekosodin primary school 7 (23.3%), Ugbowo primary school 7 (23.3%), Olua primary school 8 (26.7%), Idunowina primary school 9 (30.0%), Edaiken primary school 11 (36.7%), Okhoro primary school 6 (20.0%) and Isiohor primary school 9 (30.0%).

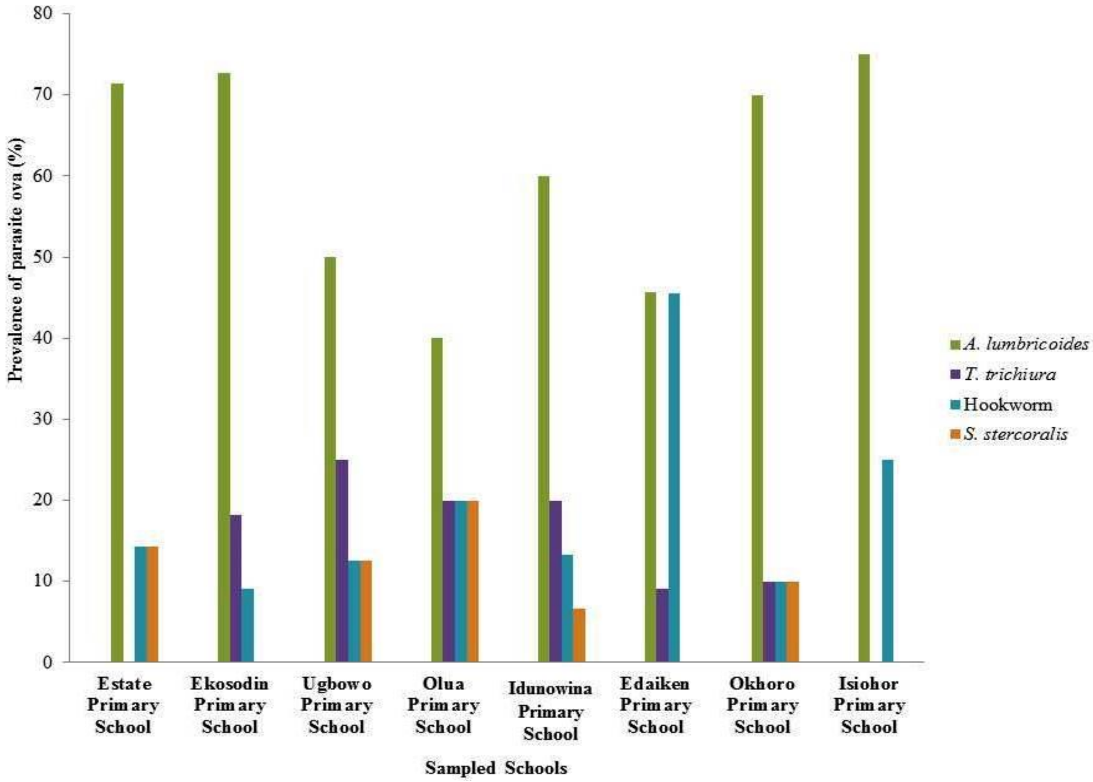

Fig. 1: Prevalence of geohelminths ova in all primary schools surveyed in Benin City

Table 1: Occurrence of geohelminths eggs/larvae recovered in the primary schools studied

Parasite species	No. of eggs	Prevalence (%)
Ascaris lumbricoides	50	59.52
Trichuris trichiura	12	14.29
Ancylostoma duodenale	10	11.91
Necator americanus	6	7.14
Strongyloides stercoralis	6	7.14
Total	**84**	

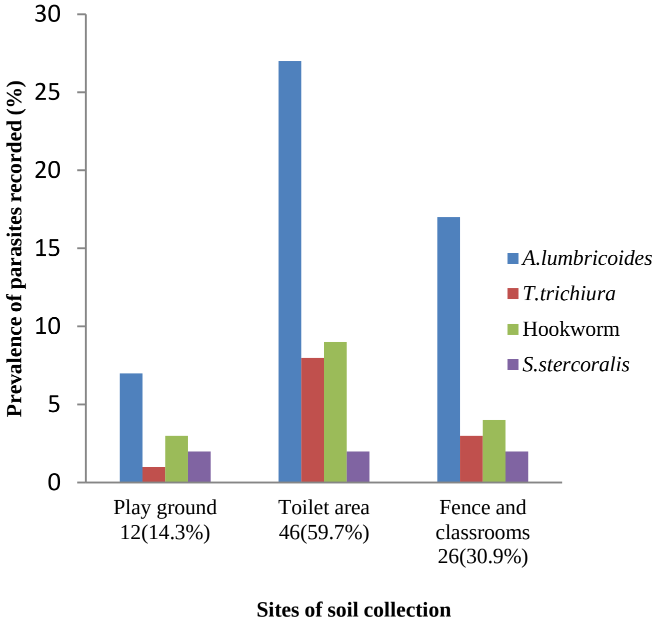

Fig. 2: Prevalence of geohelminths ova in soil with respect to sample sites

Discussion

The occurrences of geohelminth infections due to *Ascaris lumbricoides*, *Strongyloides stercoralis*, hookworms and *Trichuris trichiura* as seen in this study have been previously reported in children by different authors [24, 25]. The findings of this study supported the fact that soil-transmitted helminths are common contaminants in soils of premises of public primary schools in Benin City and many parts of Nigeria [26, 27].

The result of this study revealed an overall 25.6% prevalence of intestinal helminth infection. This was lower than the 40% prevalence recorded by [28] among asymptomatic school growing children in India. It also deviated from the 59.2% documented by [29] among school-aged children in Nigeria. Furthermore, it was also lower than the 46.3% reported by [30] among primary school children in Nigeria. The differences in findings among these studies might have been due to variations in socio-economic conditions, behavioural habits and personal hygiene of selected children, seasonal differences in conducting the survey, environmental conditions, sample size used, time of study and other geographical factors in the study areas [31].

The fact that the adult stages of these worms reside in the intestine, the presence of the ova in soil is indicative of environmental faecal pollution. Geohelminths infections thrives in communities in need of appropriate sanitation, clean water, better housing and better access to health care [32]. This is proven by the fact that Edaiken primary school which had the highest prevalence of geohelminths (36.7%) does not have toilet facilities at all. The pupils normally defaecate in the nearby bush around the school and as a result, the ova are washed into the school compound when it rains heavily, thereby contaminating the school environment. Schools with toilet facilities had no water.

The presence of helminthic ova in the soil is of great public health concern as most school children go to school barefooted leading to the high prevalence of geohelminths infections especially hookworm infections. Similar observations have been made from other parts of Nigeria such as Oyo State [6] and Cross River State [7]. The pupils either seed the soil with geohelminth eggs from their faeces or contract infection from already contaminated soil especially from behind the classrooms and back of toilet which provided a hideout for defaecation and urination for the pupils. Mixed infections with geohelminths recorded in this study have previously been reported by other investigators [12, 9 and 28].

The occurrence of geohelminths ova in the soil is due to water retention capacity and the moist nature of the zone [33]. This supports the earlier work of [34] which showed that wet areas are usually associated with increased transmission of the geohelminths as observed in this study.

The most prevalent soil-transmitted helminth was *A. lumbricoides* with a prevalence of (59.52%) followed by hookworms (19.05%) and *T. trichiura* (14.29%). The least prevalence helminth was *S. stercoralis* (7.14%). The high prevalence recorded for *A. lumbricoides* in this study could be attributed to the fact that its embryonated ova are very resistant to harsh environmental conditions and are airborne and live longer than other ova [33]. Their presence in the soil also facilitates their dissemination both far and wide. This accounts for the presence of such eggs in food items and water bodies [35]. The 59.52% prevalence recorded in study for *A. lumbricoides* corroborated the 44.8% recorded by [29] among school-aged children in Nigeria. It was also higher than the

19.8% documented by [36] among school-aged children in Ethiopia. It however agrees with the study of [28] who recorded 60% prevalence among asymptomatic school going children in India.

Hookworm infection occurs by skin penetration of infective larvae, making children who sometimes walk and play bare footed during break periods susceptible to the infection. Poor sanitary disposal of human faeces and indiscriminate defaecation are the principal factors in the aetiology of hookworm infection [37]. Dry environmental conditions encountered during the later period of this study (October-December) might have contributed to low prevalence rates of *S. stercoralis*.

Geohelminth infections are still highly prevalent among school-aged children in Nigeria and it is a major cause of morbidity in school aged children according to [38]. Poor personal and environmental hygiene, poverty and favorable climatic conditions are major factors sustaining transmission but there has not been any policy-backed effort to control it [13]. The effectiveness of school-based intervention has been demonstrated to be cost effective and feasible in Nigeria and elsewhere. The findings from this study thus support the need for government to provide adequate toilet facilities in public schools in Nigeria. There is need for the establishment of a health programme for the control of helminthiasis in school-aged children in the country [39]. Education regarding proper hygiene practice should be an integral component of the control programme. This would reduce the worm burden, contamination of the environment by these children and enable the pupils perform better in schools. It is therefore important that public health promotion be implemented by State and Local Governments. The result of this study indicates that provision of potable water, toilets and health education is important in establishing control of intestinal parasitic infections.

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