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ASSESSMENT OF SOIL TRANSMITTED HELMINTHS IN SOIL READY FOR PRIMARY SCHOOL FARMING ACTIVITY IN OMELEMA

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ABSTRACT

Approximately every rural inhabitant in Nigeria is at risk of diseases transmissible by helminthes worms also known as soil transmitted helminthes. This study evaluates the level soil transmitted helminths contamination level of soil prepared for school farming activity in Omelema. A total of 50 soil samples were collected and analyzed for soil transmitted helminths contamination using the formalin ether sedimentation technique and saturated salt floatation methods. Thirty one samples representing 62.0% were contaminated with soil transmitted helminths. The soil transmitted helminths implicated in this study are *Strongyloies* (45.6 %), *Ascaris* (36.9 %) and hook worm species (17.5 %). The presence of soil transmitted helminths in this study called for serious concern in the public health sector and demand that the rural inhabitants be adequately oriented on preventive strategies to avert prospect infection threat. The scenario in this survey suggests that prohibition of open defecation alongside personal cleanliness in private and public places if taken seriously can mitigate infections of soil transmitted helminths in every locality.

Key words: *Ascaris,* Helminths, Hookworm, Soil, Open defecation, personal hygiene.

INTRODUCTION

The soil is a significant biotic factor supporting life for both plants and animals. It provides the best atmosphere for plant growth, thereby making food available for animals including human beings and ensures their survival. Nevertheless, beneath the significance of soil as life supporting agent; lies the throughput of dispersing soil transmitted disease causing worms also called helminths. The soil is a main reservoir of helminthes egg (Yawson *et al*., 2018). Most soil in Nigeria is contaminated with a variety of heminths eggs and other infective stages pathogenic to human and animals (Olufotebi *et al*., 2019). Commonly reported neglected tropical diseases in Nigeria are perpetrated by soil transmitted pathogenic helminthes worms (Oyetunde and Oluyemi, 2023; Dahal *et al*., 2019). These pathogens also called helminthes generally infect the soil by means of indiscriminate defecation of infected persons (Amoah *et al*., 2017; Lustigman *et al.,* 2012). The soil transmitted helminthes are life threatening and are predominantly among the uninformed, and children are the most affected(Ezenwaka and Mattew, 2024; Oyetunde and Oluyemi, 2023; Olufotebi *et al*., 2019). Nevertheless, people of all ages ranging from young to adult, men and women are exposed to infections of soil transmitted helminthes.

Soil transmitted helminthes are considered as one of the group of intestinal parasites protozoa of animals including human beings that are commonly disperse through contaminated soil. These pathogens are considered neglected (Ezenwaka and Mattew, 2024; Dahal *et al*., 2019) often reported in localities with poor living conditions and limited personal hygiene especially among the utmost exposed population. Reports had shown that one third of every population in the tropics is infected with soil transmitted helminth parasites (Ezenwaka and Mattew, 2024; Oyebamiji and Hassan, 2021). The soil transmitted helminthes can orally be contracted, in some cases the larva penetrates through the skin (Amadi *et al*., 2021; Imalele *et al*., 2021). Soil transmitted helminthes pathogens are sometimes washed off from infected soil into our water bodies and increases the vulnerability of the rural inhabitants in places with lack of purified water source. Feeding on raw fruits and vegetable is also a significant factor predisposing individuals to soil transmitted helminthes pathogens.

Despite the lack of knowledge regarding the possibility of contracting disease of soil

transmitted helminthes from soil in Omelema, no scientific research has been carried out in the locality to establish the prevalence and contamination level of soil transmitted helminthes in farming soil couple with the open defecation habit ongoing on fallowed lands especially in the school premises. Considering the life pattern of the school children in Omelema toward farm soil, this study will unveil the chance of catching diseases of soil transmitted helminthes and enhances general acceptability of soil transmitted helminthes preventive programs in the locality.

The people of Omelema have the habit of using the fallow school land as toilet for open defecation concurrently as they allowed the land to regain nutrient approaching the farming season. During the farming activity, the uniformed school children on the ignorance of soil status regarding contamination with soil transmitted helminthes usually play with the soil while preparing ridges. In certain scenario the pupils are reportedly found playing with the soil up to their ears, eyes and mouth. Considering the living habit of the pupils of Omelema primary school toward farm soil, this study is aimed at assessing the presence of soil transmitted helminthes pathogens in soil from fallow land cleared for school farming activity.

MATERIALS AND METHODS

Study Location: This study was carried in Omelema. Omelema is a community in Abua ethnic nationality in Rivers State, Nigeria. The indigenes are farmers and the primary school in Omelema has several plots of land which are used for school farming activities. Omelema is the bread land of Abua and is situated 5° 42' 20" E and 7° 32' 16" N.

Soil collection: The piece of land measuring 75 cm by 50 cm cleared for the school farm activity was portioned into five plots and 50 soil samples were collected across the five plots. These samples were packed into white waterproof bags and taken to the laboratory for parasitological analysis.

Parasitological analysis of soil: Soil bio-assay was done employing the saturated salt floatation and formalin ether sedimentation technique as documented in Arora and Arora (2010) and Yawson *et al.* (2018) respectively.

For the saturated salt floatation method, 2g of soil from each sampling bag was placed in a plastic cup measuring 40 mm by 20 mm and 25 drops of saturated salt of 1.2g were added and was carefully stirred using an iron rod. Floating debris was removed and more salt was added in drops until it nearly fill the cups. Glass slides were gently placed at the surface of the liquid in the cups and were left undisturbed for 20 minutes. At the expiration of 20 minutes, the slides were gently removed and viewed under the microscope using x4, and x10 objectives.

From each sampling bag, 2g of soil was also taken and gently mixed with 5 ml of 10 % formalin in a glass beaker and filtered through a sieve of two layers gauze into a centrifuge tube. The tube was filled with 3 ml of ethyl acetate solution and mixed thoroughly with a wooden stick. The tubes was closed with rubber stopper and agitated vigorously. The solution was then centrifuge at 2000 rpm for five minutes. After the centrifugation, four layers were visible. All the layers were discarded except the layer with sediment using suction pipette. The sediment was then viewed in glass slide covered with cover slip under the microscope at x4, x10 objectives.

Data analysis: Data in this study was presented in simple percentage. However, test for significance in the occurrence of soil transmitted helminths was achieved suing one way analysis of variance in SPSS version 23.

RESULTS

Soil transmitted helminths in school farm soil in Omelema

The soil samples collected in this survey were 50, 10 from each plot. Among the 50 collected soil samples, 31(62.0%) were contaminated with the eggs of soil transmitted helminths pathogens (Table 1). Some soils were found contaminated with a single helminth egg while some had 2-3 parasites in that order. For instance, soil 2, 5 and 9 in plot 1 were contaminated with the eggs of Ascaris, Strongyloides and Hookworm. All the

positive samples in plot 2 and 4 had single helminth eggs and 2 samples in plot 3 and 5 were contaminated with the eggs of Ascaris and Strongyloides, and Hookworm and Ascaris respectively.

Table 1: Infestation of soil with transmitted helminths in Omelema.

Plot	No of soil collected	infected	% infected
1	10	10	32.3
2	10	4	12.9
3	10	7	22.6
4	10	3	9.7
5	10	7	22.6
Total	**50**	**31**	**62.0**

Prevalence of soil transmitted helminths in school farm soil in Omelema

The soil transmitted helminthes pathogens prevalence in Omelema recovered in this survey were *Strongyloides stacoralis*, Hookworm species and *Ascaris lumbricoide*. The actual incidence of the soil transmitted helminthes in percentage was 45.6%, 36.9 % and 17.5 % for *Strongyloides, Ascaris lumbricoide* and hook worm species respectively. Soil transmitted helminthes prevalence by sampling plot in this survey shows that plot 1 had helminths parasite concentration of 25 (24.5%) and 14 (13.6%), 23 (22.3%), 18 (17.5%) and 23 (22.3%) were seen in plot 2,3,4 and 5 respectively. However, the overall assemblage of soil transmitted helminthes in this study recorded high prevalence of *Strongyloides* 45.6% closely followed by *Ascaris* 36.9% and Hookworm species were 17.5%.

Table 2: Prevalence of soil transmitted helminths in school farm soil in Omelema.

Plot	*Ascaris* (%)	*Strongyloides* (%)	Hookworm (%)	Total (%)
1	12 (31.6	9 (19.0)	4 (22.2)	25 (24.3)
2	4 (10.5)	3 (6.4)	7 (38.8)	14 (13.6)
3	8 (21.0)	11 (23.4)	4 (22.2)	23 (22.3)
4	14 (36.8)	3 (6.4)	1 (5.5)	18 (17.5)
5	0	21 (44.6)	2 (11.1)	23 (22.3)
Total	**38 (36.9)**	**47 (45 .6)**	**18 (17.5)**	**103 (100)**

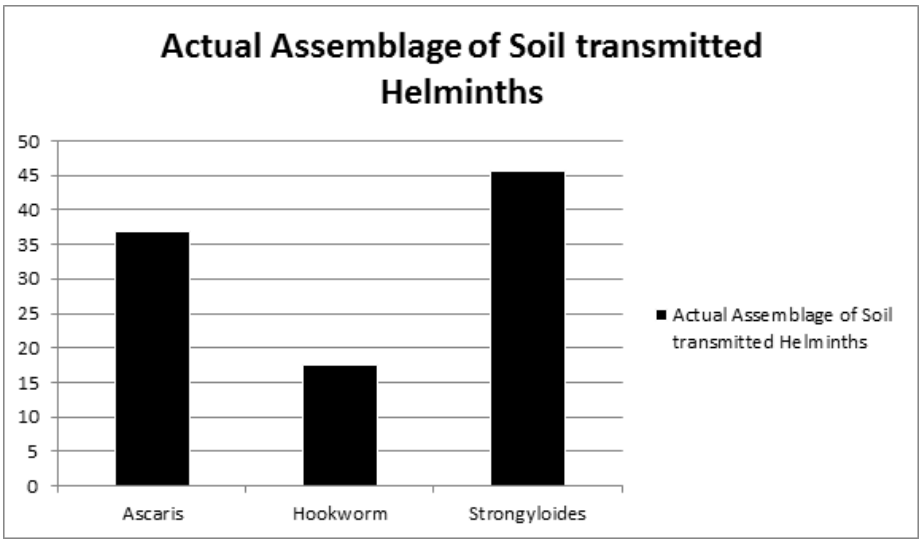

Figure 1: Actual assemblage of soil transmitted helminths of school farm soil in Omelema.

DISCUSSION

Disease burden due to infections of soil transmitted helminths around the world especially in the tropics has raise consciousness on soil bio-assay to ascertain contamination level and forecast potential outbreak on human and keep human being on the check by employing the most possible preventive approach. In this study, 50 soil samples were subjected to parasitological analysis for soil transmitted helminths contamination and 31 (62.0%) were reportedly positive of the pathogenic worms. The degree of soil contamination as seen in this survey concur with Olufotebi *et al.*(2019) who reported a similar result on parasitological test of soil for soil transmitted helminths in Ibadan. Elsewhere, Oyebanmiji *et al.* (2021) reports that one in every three rural inhabitants in Nigeria one is infective of soil transmitted helminths. In this survey, the result is indicative that the people of Omelema are vulnerable to soil transmitted helminths and must take the most possible preventive approach such as adequate personal hygiene and good sanitation to avert outbreak.

The availability of soil transmitted helminths in this study called for serious concern in the public health sector and the rural inhabitants must adequately be oriented on preventive strategies to avert prospect infection threat. Nevertheless, this result further indicates that human infection is possible all through the year and not peculiar to season. The use of the fallowed site as toilet alternative for open defecation could have propelled soil contamination in Omelema. The scenario suggests that prohibition of open defecation alongside personal cleaningness in private and public places if taken seriously can mitigate infections of soil transmitted helminths in our locality. Yawson *et al.*, (2018) reports that children from non-poor houses with good hygienic habit can still contract soil transmitted helminths from the public not excluding schools.

The soil transmitted helminths reported in the school farm soil in Omelema were Ascaris, hookworm and Strogyloides. The actual incidence of *Strongyloides* (45.6%) was higher compare to ascaris (Arora and Arora, 2010) and hookworm species. This observation is in conformance with Olufotebi *et al.* (2019). Strongyloides require no host for propagation, a feature which could have influenced its profusion in this study. The absence of *Trichiris* species in this study as against the result of Oyebamiji *et al.* (2018) depicts that soil contamination with soil transmitted helminths cannot be predicted, not minding the sanitary status of the environment. The missing of an important soil transmitted helminths species like *Trichiris* species in this study further suggests that the survival of parasites in the environment requires species adaptive features and only parasites with such features can prevail competitors and gain survival.

All the soil transmitted helminths recovered in this study are globally reported as helminths pathogens of severe health challenges. For instance, Hookworm species have globally been affiliated with type 1 hypersensitivity reaction in pulmonary migration in human beings (Hassan *et al.*, 2017; Arora and Arora, 2010). *Ascaris* species is associated with immune system pathology and pancreatitis (Imalele *et al.*, 2021; Njiru *et al.,* 2016).

CONCLUSION

The inhabitants of Omelema are vulnerable to soil transmitted helmniths infections. Therefore, preventive practice such as personal cleanliness and prohibition of open defecation should be encouraged to avert outbreak. Soil transmitted helminths pathogens constitute a significant threat to survival in the rural low income populations not excluding the inhabitants of Omelema.

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CONFLICT OF INTEREST

No conflict of interest.

AUTHORS' CONTRIBUTIONS

The first author designed the study. Both authors carried out the soil sampling, laboratory bioassay, review literatures and manage the data respectively.

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