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PREVALENCE OF HELMINTH EGGS IN SOILS OF SELECTED PUBLIC AND PRIVATE PRIMARY SCHOOLS IN KALTUNGO, GOMBE STATE, NIGERIA

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ABSTRACT

Helminths are group of parasites causing neglected tropical diseases of public health concern. It is important to map out soil contaminated with helminth eggs in selected primary schools and to project which school need health. This study screen soil samples for the prevalence of helminth eggs in soils of selected public and private primary schools in Kaltungo. A total of 280 (two hundred and eighty) Soil samples were collected from the ten randomly selected schools and Chi-square test was used to test for associations. The overall prevalence was (73.93) of helminth eggs found in public and private primary schools. There was statistically significant different ($p < 0.05$) in prevalence of helminth eggs in soil samples of public and private schools. The highest species-specific prevalence was *Ancylostomaduodenale*eggs with 285(26.71% prevalence) with a mean of 146.5 ± 69.25, while the least specie was *Trichuristrichiura*eggs with 30(2.81% prevalence) There was a significant association between the occurrence of helminth egg and season ($\chi^2 = .5.9031$, $p = 0.015$). The result of the study therefore indicates that there is high prevalence rate of helminths eggs in the selected primary schools within Kaltungo Metropolis. Therefore, there is a need of regular deworming of the school children and sanitary majors of the school premises should all be improved.

Keywords: Deworming**,** Helminth, Neglected Parasite, Prevalence.

INTRODUCTION

Helminths are group of multicellular eukaryotic invertebrates that possess flattened or tube-like bodies showing bilateral symmetry. The main categorizes of parasitic helminths include nematohelminthsand platyhelminths, which was divide up into cestodes (tapeworm) and trematodes (CDC, 2013). The rate of helminthic infection ispredominantly amongst population living in middle- and low-income countriesremains a major public health concern.

Soil-transmitted helminth (STH) infections are among the most common infections worldwide with an estimated 1.5 billion infected people or 24% of the world's population. These infections affect the poorest and most deprived communities with poor access to clean water, sanitation and hygiene in tropical and subtropical areas, with the highest prevalence reported from sub-Saharan Africa, China, South America and Asia (WHO, 2023).

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They are transmitted by eggs present in human faeces, which in turn contaminate soil in areas where sanitation is poor. Over 260 million preschool-age children, 654 million school-age children, 108 million adolescent girls and 138.8 million pregnant and lactating women live in areas where these parasites are intensively transmitted, and are in need of treatment and preventive interventions (WHO, 2023).

Morbidity is related to the number of worms harboured especially in children. School-age with infections of light intensity usually does not suffer from the infection. Heavier infections can cause a range of symptoms including intestinal manifestations (diarrhoea and abdominal pain), malnutrition, general malaise and weakness, and impaired growth and physical development(WHO, 2023).

Worm infection in school-aged children is often the most severe in any age group and persistent infection has a negative impact on many aspects of a child's health, nutrition, cognitive development, learning and educational access and achievement School age group have the highest incidence of STH infections globally (Saboya*et al*., 2010).

The poor nutritional status or malnutrition due to these infections has also been implicated in poor cognitive functioning of preschool aged children when enrolled in schools (Lwanga et al., 2012). Malnutrition affects the physical, mental, and social wellbeing and development of children, and it has been an underlying cause of over half of child deaths in many developing countries (Omitola*et al*., 2016)

There is lack of documented information on the presence of helminth eggs in soils of public and private primary schools Kaltungo Local Government Area Council.

MATERIALS AND METHODS

Study Area

This study was conducted in Kaltungo Local Government Area of Gombe State. Kaltungo is located in the southern part of Gombe State and is the headquarter of the local government. It is west of the local government area on the A345 highway at 9^{o} 48’51N 11^{o} 18’32” E / 9.81417^{o} N 11.30889^{o} E. It has an area of 881km^{2} and a population of 149,805 (census, 2006). There are two distinct seasons in Kaltungo; the rainy season which is observed between May to October and dry season which comes up from November to April.

Study Design

A cross sectional study was carried out. The list of the schools was collected from Kaltungo Local Education Authority and the schools were randomly selected.

Collection of Soil Samples

A total of 280 soil samples were collected within two periods between March-April 2020 (dry season) and August-September 2020 (rainy season). During each season, soil samples were collected at three sites of each school: around latrines, at playgrounds, and behind classrooms of both public schools; Umar Memorial primary school (9.81472, 11.31527), Kalaring Primary school (9.812318, 11.309094), Nasarawa primary school (9.825779, 11.315616), Termana Primary school (9.814536, 11.301333) and L.E.A primary school (9.820539, 11.311701) and private primary schools; kings Academy (9.817750, 11.308982), Raudatul Qur’an International Primary school (9.814353, 11.313629), Nifak Academy (9.818321, 11.328552), Mai Lamai Academy (9.825094, 11.311383) and Walter Gowan’s primary School (9.828947, 11.302734).The samples were transported to the Department of

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Biochemistry Gombe State University whereparasitological analysis was carried out.

Laboratory Analysis of the Samples

In the Laboratory, eggs were recovered using formal-ether sedimentation for concentration of trematode eggs and Zinc Sulphate Sucrose floatation for concentration of Nematode and Cestod eggs as described by Cheesbrough (2000). Identification of helminth ova/eggs was carried out based on their characteristics and morphologies as described by Soulsby (1982), with the aid of atlas.

Data Analyses

The data was analyzed using Chi-square to test for association between private and public schools, association between the occurrence of helminth eggs and season of the year, (P values < 0.05 shows a significant difference).

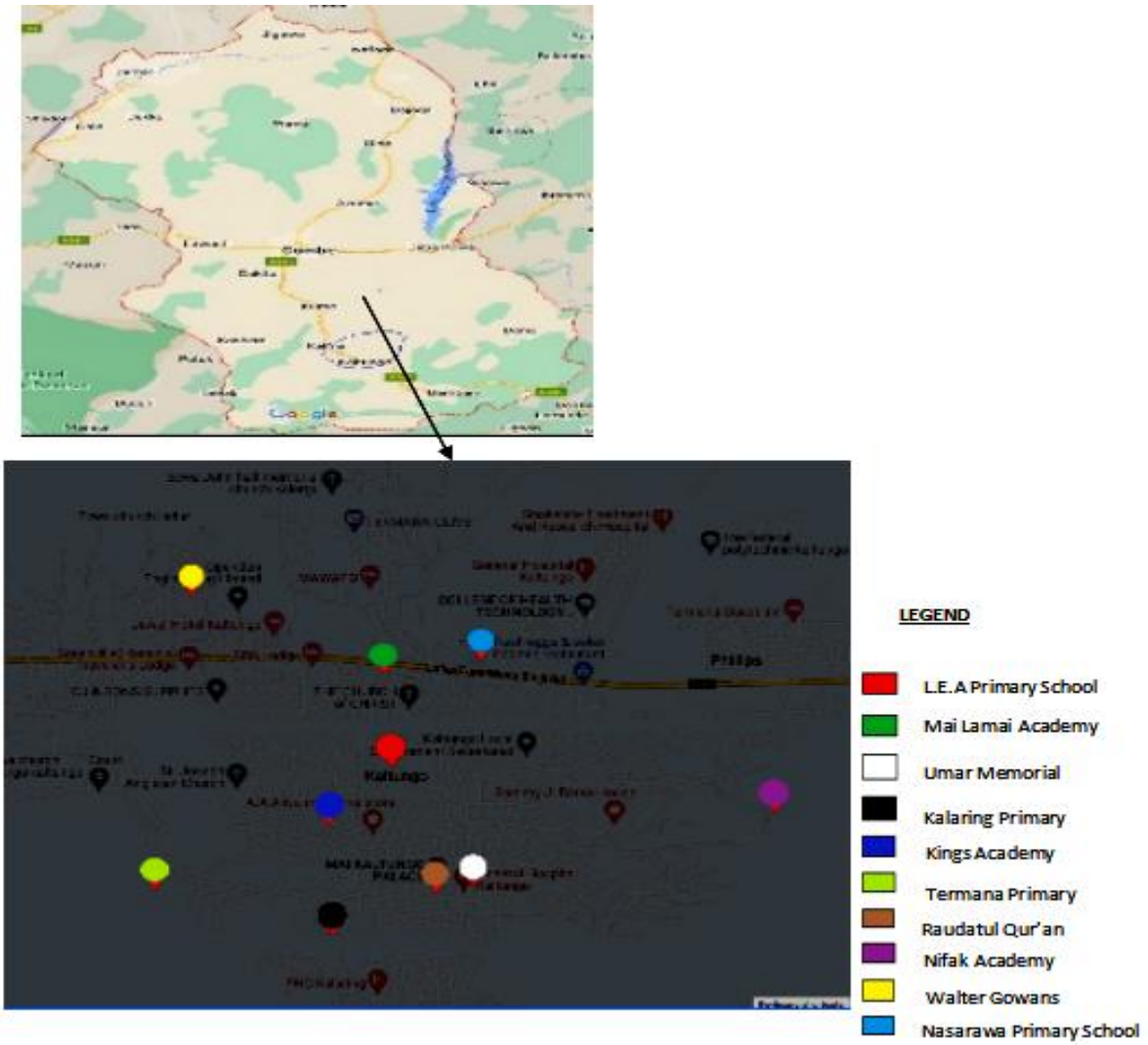

Figure 1: Map of the Study Area, Map A Showing Gombe State and Map B showing the sample side

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RESULTS

Prevalence of Helminth Eggs found in the Soils of the Selected Primary School in Kaltungo

The study on prevalence of helminth eggs in soils of selected public and private schools revealed that eight helminthes egg parasite were recovered from 280(207) soil samples (140 samples each from public and private primary schools), representing 73.9 % of the population from the 280 soil samples examined. High prevalence 78.6 % was recorded in public schools compare to 69.3 % prevalence recorded in private schools (Table 1).

However, there was statistically significant difference ($p < 0.05$) in prevalence of helminth eggs in the soil samples of the selected public and private schools. The prevalence of helminth eggs in soils of selected public primary schools reveals that Termana primary school soil had highest prevalence of 24.55 % representing 27 out of the total soil samples collected, while Kalaringprimary school soil had the least prevalence of 14.55 % representing 16 out of the total soil sample collected (Table 2) however, there was no statistically difference ($p > 0.05$) in prevalence of helminth eggs and soil samples obtained from the different public schools. The prevalence of eggs in soils of selected private schools reveals Kings Academy soil had highest prevalence of 26.80 % representing 26 out of the total soil samples collected, while NefakAcademy soil had the least prevalence of 13.40 % representing 13 out of the total soil samples collected (Table 3).

Table 1: Prevalenceof helminth eggs in soil samples of both public and private schools

Schools	Number of samples collected (n)	No of soils positive to helminths (%)
Public	140	110(78.6)
Private	140	97(69.3)
Total	280	207(73.9)

$X^2 = 0.4687$, $p = 0.004$

Table 2: prevalence of helminth eggs in soils of selected public schools in Kaltungo

Schools	No. of samples collected	No. of positive samples (%)	Number of eggs recovered	Number of eggs recovered (%)
Kalaring Primary Sch.	20	16 (14.55)	85	14.48
Umar Memorial Primary Sch.	30	23 (20.90)	132	22.48
Termana Primary Sch.	30	27 (24.55)	137	23.34
L.E. A Primary Sch.	30	24 (21.82)	132	22.49
Nasarawa Primary Sch.	30	20 (18.18)	101	17.21
Total	140	110	587	100

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Table 3: prevalence of helminth eggs in soils of selected private primary schools in Kaltungo

Schools	No. of samples collected	No. of positive samples (%)	Number of eggs recovered	No. of eggs recovered (%)
Nefak Academy Nur/Pri	20	13 (13.40)	77	16.04
Raudatul Qur'an Inter. Nur/Pri		25 (25.77)	123	25.62
Kings Academy Nur/Pri. Sch.	30	26 (26.80)	126	26.25
Mailamai Academy Nur/Pri. Sch.	30	17 (17.53)	73	15.21
Walter Gowan'sNur/Pri Sch.		16 (16.50)	81	16.88
	30			
	30			
Total	140	97	480	100

Species specific prevalence of helminths eggs in soils of selected public and private school

Species specific prevalence revealed that highest number of eggs of *Ancylostomaduodenale*285(26.71%) with mean of 146.5± 69.25 were recovered, followed by *Ascaris lumbricoides* eggs 26 (24.37 %) and mean of 134.0 ± 63.0 while *Trichuristrichiura*had the least egg of 30 (2.81 %) and mean of 19.0 ± 5.5 (Table 4).

Table 4: Species specific prevalence of helminthes eggs in soils of selected primary schools in Kaltungo

Type of egg	No. of eggs recovered (n)	Percentage (%)	Mean ± S.E.M
Ascaris lumbricoides	260	24.37	134.0 ±63.0
Schistosome haematobium	32	3.01	20.0±6.0
Ancylostomaduodenale	285	26.71	146.5±69.25
Strongyloidestercoralis	90	8.43	49.0 ±20.5
Trichuristrichiura	30	2.81	19.0 ±5.5
*Fasciola*spp	63	5.90	35. 5 ±13.75
*Taenia*spp	216	20.24	112.0±52.0
*Toxocara*spp	91	8.53	49.5 ±20.75
Total	**1067**	**100**	**537.5 ± 264.75**

Seasonal Prevalence of Helminth Eggs in Soils of the Selected Public and Private Schools in Kaltungo Metropolis.

Table 5, shows the association between the prevalence of helminth eggs and seasons. The total number of soil samples collected was 280; eggs of helminthes were recovered in 207 soil samples representing 73.93 % of the samples. Out of 140 samples collected during the rainy season, 133(64.25 %) was positive for helminth egg While 74(35.75 %), out of 140 samples collected during the dry season were positive (74) with helminth eggs. There was statistically significant difference (< 0.05) in prevalence of helminth egg in the dry and rainy seasons.

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Table 5: Shows the Prevalence of helminth eggs and seasons of the Year

Schools	Dry soil samples infected with helminthes eggs (%)	Rainy soil samples infected with helminthes eggs (%)	Total
Public	35 (47.30)	86 (64.66)	121(58.45 %)
Private	39 (52.70)	47 (35.34)	86 (41.55 %)
Total	74	133	207

$\chi^2 = 5.9032$, P = 0.014.

DISCUSSION

The overall prevalence of helminth eggs obtained from the selected public and private schools in this study was 1067(73.93%). The prevalence of helminth eggs obtained in this study is slightly lower to that of Okwa*et al*. (2023) who noted a prevalence of 78.0% in a similar study in soils samples from four communities in Ojo Local Government Area of Lagos State, Nigeria and higher to the study of Chigozie (2014), who recorded (62.5%) in Bwari Area Council, Abuja. The high prevalence in this study could be due to the indiscriminate defecating, urinating & dumping of refuse in the playgrounds.

The rate of contamination in the selected schools with helminth eggs revealed that public schools had lower prevalence compared to that of Ogwurike*et al.* (2010) who noted (82.52%) and Chigozie (2014) who recorded (70.4%), while that of the private schools was close to the report of Ogwurike*et al.* (2010) who note (47.83%) and lower to the study no Chigozie, (2014) who recorded (25.6%) school.

In this study, the prevalence of contamination of helminth eggs was higher in public schools compared to private schools because environmental sanitation and hygiene was poorer in public schools compared to private schools.

Majority of the private schools were fenced, but humans and stray animal's defecation can be the main source of contamination of the soils. Nefak and Kalaring lacks toilet facilities therefore, pupils in this schools urinate behind the class room in some cases they defecate behind the classes, there by contaminating the environment within indiscriminate defecation by both humans and stray animals.

Detection of helminth eggs was associated with the population of stray animals like (dogs, goats, sheep's); heaps of refuse this also explains the role domestic animals play in fecal contamination of the environment.

Species specific prevalence reveals *Ancylostomaduodenale* egg had the highest number recovered from the soil samples of the selected public and private primary schools which was higher to the prevalence reported by Aschalew*et al*. 2022 (16.5 %) and closely related to the prevalence recorded by Chigozie 2014, (26.7 %).

However, the high prevalence of *Ancylostomaduodenale*in this study could be as a result of indiscriminate dumping of refuse in the school premises, open field defecation practices, and poor personal and inadequate environmental hygiene (Aschalew*et al*., 2022).

Ascaris lumbricoides was the second helminth egg recovered in prevalence in the soil samples of the schools (Table 4), which was lower to the work of Okwa*et al*. (2023) who reported 30.2 % prevalence of *Ascaris lumbricoides* in soil samples in Ojo Local Government Area in Lagos. *Ascaris lumbricoides* prevalence in this study was in line with the work of Mobolanle and Oluwasejun, (2021) they recorded (25.5 %) of

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Ascaris lumbricoides in a similar study in Ipongu, Ondo State while the least specie of helminth in this study was *Trichuristrichiura*eggs which was lower to the study of Mobolanle and Oluwasejun, (2021) they recorded (0.7 %) and similar when compare to the study of Okwa*et al*. (2023) who reported (2.56 %).

The low rate of *Trichuris* eggs could be as a result of the fact that the environmental condition did not favor them. *Trichuris* eggs are killed at slightly lower temperatures (52°C to 54°C) for a shorter time than *Ascarislumricoides*eggs (Mohammed, 2010).

There was statistically significant difference (χ^2 = 4.2088, P = 0.0427) between the occurrence of helminth eggs and the season of the year. Out of 140 samples collected during the rainy season, 133(64.25 %) were positive for helminth eggs as against 74 (35.75 %).

More so, Chigozie, (2014), reported a statistically significant difference between the prevalence of helminth eggs and the season of the year. In this work, one hundred and thirty-three (64.25 %) out of 140 samples collected during the rainy season were positive for helminth eggs which is closely similar to the work of Maikai*et al.* (2008) who noted 215(58.1%) out of 370 samples collected during the rainy period were positive for helminth eggs.

Also, Chigozie (2014) who revealed 149(74.5 %) samples were positive for helminth egg during raining period. Seventy-four (35.75 %), out of 140 samples collected during the dry season were positive for helminth eggs in this work while Maikai*et al.,* (2008) revealed that 162(68.1%) out of 238(39.1%) samples collected during the dry season were positive for helminth eggs and concluded that a higher detection of helminth eggs during the dry harmattan period than in the wet rainy periodcould be as a result of rainfall which may have washed away the eggs. Chigozie (2014) noted Fifty-one (25.5%) out of 200 samples collected during the dry season were positive for helminth eggs.

The reason for high prevalence in raining season could be as a result of the fact that raining season favors the multiplication and distribution of helminth eggs by providing optimum condition and conducive environment for their survival.

CONCLUSION

The study showed that there is high level of contamination in the soils of selected public and private primary School playgrounds, around latrines and behind class rooms (73.93%) in Kaltungo of Gombe State, Nigeria. There was statistically significant difference ($P<0.05$) between the prevalence of helminth eggs and the soil in the schools, 110(53.14%) of the 140 soil samples from public schools were positive for helminth eggs, while 97(46.86%) of the 140 soil samples from private schools were positive for helminth eggs. Hence, Public schools were more contaminated than private schools.

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