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The Incidence of Geohelminth Eggs Among Primary SchoolPupils in Kaduna State, North West, Nigeria

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ABSTRACT

The life cycle of Geohelminths requires soil for incubation before becoming infective. The infections of these parasites constitute a major health challenge in sub-Saharan Africa. Methodology: This study was carried out to investigate the incidence of Geohelminths among Primary School Pupils, in Unguwan Kadara, Kaduna State. Three hundred and fifty (350) stool samples were collected. The formal ethyl acetate concentration Technique was used to analyze the Stool samples. Results: Our study revealed the overall prevalence of these Geohelmiths to be 22.6%. Hoewever, for Hookworm infection it was 14.0 %, Ascaris lumbricoides and Taenia spp were 3.1% each and Schistosoma mansoni infection was 2.3 %. The infectivity by age revealed that, (3-5) years had total infectivity of 14.4%, (6-8) years 26.1%, (9-11) years 28.9%, 12-14 years 18.9% and 15 years and above had 50.0% but the difference statistically not significant (p>0.05). Furthermore, infectivity by class distribution showed that primary one,2,3,4,5 and 6 had total infectivity of 15.0%, 23.3%, 23.3%, 33.3%, 20.0% and 20.0% respectively but the statistical difference was not significant (p>0.05). The difference in levels of pupils' knowledge of Geohelminths was statistically significant (p<0.05). Conclusion: Intensive and continuous health education, provision of pipe-borne water, improved environmental sanitation and continuous deworming campaigns in this community will help in reducing the incidence of Geohelminthiasis in Kaduna state.

Keywords: *Geohelminths, Stool samples, Pupils, Unguwan, Kadara*

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1. Introduction

Geohelminths are soil-transmitted parasites, their ova require a period of incubation in the soil before becoming infective to humans (Omotola & Ofoezie, 2019). Geohelminth infections constitute a significant public health challenge in developing countries, with more than 1.5 billion people worldwide are currently infected with one or more of these Geohelminths (WHO, 2020). Children are at greatest risk of acquiring Geohelminthiasis which is often associated with poor growth, reduced physical activity, anaemia and impaired learning ability (Oluwatobiloba, Henry & Prosper, 2020). Geohelminthiasis is promoted by poor hygiene habits such as continuously deleting human and animal faeces on the soil. This habit supports contact with Geohelminths ova or larvae in the soil with children mostly acquiring the infection either directly or indirectly (Akande, Adeleke & Akinwale, 2002). Geohelminthiasis is more prevalent among Pupils aged 5-14 years and constitutes 12% of the total disease burden in children (Yared, Mamdouh, Girma & Shiferaw, 2001). Many people become infected by consuming the eggs from contaminated food or drink, and some contract them by the larva penetrating their skin. This is a particular issue in poor countries because many people do not always wear shoes and where foods are frequently dirty. Many people go long distances barefooted merely to fetch tainted water for their family as a result they contract illnesses and Geohelminths (Oluwatobiloba et al., 2020). Due to their immature physical development and increased immunological susceptibility, children may also be more vulnerable to the negative consequences of Geohelminthic infection (Oluwatobiloba et al., 2020). Geohelminthic infection typically manifests as symptoms in people with high worm burden, intestinal blockage, sleeplessness, vomiting, weakness, and stomach ache are all symptoms of intestinal helminthic infection. Worms' hosts may experience general discomfort as a result of their adhesion to the gut and natural motility (John & Williams, 2016). Temporary asthma attacks and other respiratory symptoms may also result from Ascaris larvae migrating through the respiratory airways. Moreover, worms travelling towards the upper digestive tract may cause vomiting (Forrester & Scott, 2014). It's also important to take into account the possibility that the immunological response brought on by Geohelminths infection may deplete the body's capacity to fight off other illnesses, rendering afflicted people more susceptible to co-infections. Reasonable evidence suggests that Geohelminthiasis is to blame for the persistent occurrence of AIDS and TB in underdeveloped nations, especially in African countries (WHO, 2014). Microscopy, radiology, serology, haematology, and molecular techniques can all be used to diagnose intestinal Geohelminths (Mirabeau, Gedeon, Paul, Michael, Meral & Ayola, 2020). These helminths include intestinal trematodes (Schistosoma species, Fasciolopsis buski, Fasciola hepatica etc). Intestinal cestode (Taenia species, Echinococcus granulosus, Diphyllobothrium latum, Hymenolepis nana).Intestinal nematodes (Hookworm species, Ascaris lumbricoides, Enterobius vermicularis, Trichuris trichiura, Strongyloides stercoralis) (Oluwatobiloba et al., 2020). Despite the health risks associated with Geohelminthiasis infection, to the best of our knowledge data on the prevalence of infection among primary school pupils in this locality has not been investigated. This study aimed to investigate Geohelminthiasis infection among the pupils and their level of knowledge on Geohelminths.

Material and Methods

Study Area:

The study area was Unguwan Kadara, located in Chikun Local Government Area of Kaduna State. Chikun Local Government is located between latitude 100 191-100 291 North and longitude 70141-70251 East (Olayiwola, 1997). The total population of the Local Government Area is 372,272, it has an Area of 4,646 km2 with a density of 108.2 /km2 (Census, 2006). It is a rural area with a rainy season from May to October and a dry season from November to April. The inhabitants are predominately farmers and petty traders with Adara as the major tribe. They have poor sources of water, and many of them resort to the use of water from streams and wells. They also have no access to good toilet facilities thereby defecating indiscriminately around their environment.

Ethical Approval:

Permission was sought and gotten from Chikun Local Government Education Authority before the commencement of this study.

Stool sample Collection and analysis:

Wide-mouthed labelled transparent plastic containers were given to 350 primary school pupils to provide their early morning stool. Each labelled container had the pupil's name, age, gender, class and research number. Also, to further obtain their socio-demographics knowledge on Geohelminths and structured questionnaires were given to pupils in primary 4-6. The stool samples collected were transported to the Public Health Laboratory Department of Community Medicine, Kaduna State University for analysis. The stools were examined for ova of Geohelminths using the Formol ethyl acetate concentration Technique as described by CDC, (2016). The data obtained were analysed using Chi-square to determine the level of association and a probability value of $p<0.05$, was considered statistically significant.

Results

Table 1: The overall prevalence of the Geohelminths was found to be 22.6%. Hookworm infection was 14.0 %, Ascaris lumbricoides and Taenia spp. were 3.1% each and Schistosoma mansoni infection was 2.3 %.

Table 1: The Prevalence of Geohelminths among Three hundred and fifty Primary School Pupils

Intestinal helminths	No. infected (%)
Hookworm	49 (14.0)
A. lumbriciodes	11 (3.1)
Taenia spp.	11 (3.1)
S. mansoni	8 (2.3)
Total infected	79 (22.6)
Total uninfected	271 (77.4)

(n=Number examined, AL= Ascaris lumbricoides, HK= Hookworm, SM=Schistosoma mansoni)

2. The infectivity by age showed that 3-5 years have total infectivity of 14.4%, 6-8 years have infectivity of 26.1%, 9-11 years have infectivity of 28.9%, 12-14 years have infectivity of 18.9% and 15 years and above have 50.0% infectivity. Our findings (x2=18.920, p=0.090) revealed that, the difference obtained between the groups was statistically not significant (P>0.05) as shown in table 2.

Table 2: Distribution of Geohelminths among different Age groups of the pupils

Age (Years)	n	AL	HK	Taenia	SM	Total
3–5	90	3 (3.3)	6 (6.7)	2 (2.2)	2 (2.2)	13 (14.4)
6–8	92	5 (5.4)	12 (13.0)	6 (6.5)	1 (1.1)	24 (26.1)
9–11	90	0 (0.0)	22 (24.4)	0 (0.0)	4 (4.4)	26 (28.9)
12–14	74	3 (4.1)	7 (9.5)	3 (4.1)	1 (1.4)	14 (18.9)
>15	4	0 (0.0)	2 (50.0)	0 (0.0)	0 (0.0)	2 (50.0)
Total	**350**	**11 (3.1)**	**49 (14.0)**	**11 (3.1)**	**8 (2.3)**	**79 (22.6)**

(n=Number examined, AL= Ascaris lumbricoides, HK= Hookworm, SM=Schistosoma mansoni)

2. Table 3, reveals the distribution of Geohelminths infection based on the Classes of the pupils. It shows that, primary one (1),2,3,4,5 and 6 had total infectivity of (15.0, 23.3, 23.3, 33.3, 20.0 and 20.0)% respectively. However, the difference (x2=21.296, p=0.128) was not statistically significant (p>0.05).

Table 3: Distribution of Geohelminths according to the Classes of the pupils

Class	n	AL	HK	Taenia	SM	Total
One	60	2 (3.3)	5 (8.3)	1 (1.7)	1 (1.7)	9 (15.0)
Two	60	5 (8.3)	4 (6.7)	4 (6.7)	1 (1.7)	14 (23.3)
Three	60	1 (1.7)	9 (15.0)	3 (5.0)	1 (1.7)	14 (23.3)
Four	60	1 (1.7)	15 (25.0)	0 (0.0)	4 (6.7)	20 (33.3)

Five	60	0 (0.0)	9 (15.0)	2 (3.3)	1 (1.7)	12 (20.0)
Six	50	2 (4.0)	7 (14.0)	1 (2.0)	0 (0.0)	10 (20.0)
Total	**350**	**11 (3.1)**	**49 (14.0)**	**11 (3.1)**	**8 (2.3)**	**79 (22.6)**

(n=Number examined, AL= Ascaris lumbricoides, HK= Hookworm, SM=Schistosoma mansoni)

Table 4: This table reveals the distribution of Geohelminths infection based on the pupils gender. Infectivity by gender showed that Females had lower infectivity (21.7%) compared to their male counterparts (23.4%). Notwithstanding, the difference (x2=2.820, p=0.420) between the groups was not statistically significant (p>0.05) (Table 4).

Gender	n	AL	HK	Taenia	SM	Total
Female	175	7 (4.0)	24 (13.7)	5 (2.9)	2 (1.1)	38 (21.7)
Male	175	4 (2.3)	25 (14.3)	6 (3.4)	6 (3.4)	41 (23.4)
Total	**350**	**11 (3.1)**	**49 (14.0)**	**11 (3.1)**	**8 (2.3)**	**79 (22.6)**

Table 4: Distribution of Geohelminths with Gender of the pupils

AL=Ascaris lumbricoides, HK= Hookworm, SM= Schistosoma mansoni, n=number examined

Table 5: The difference in the level of pupils' knowledge of Geohelminths was statistically significant (p<0.05) as shown in table 5. One hundred and seventy (170) questionnaires were given to pupils in primary four (4) to six (6) to assess knowledge of Geohelminths among the pupils. Pupils from one (1) to three (3) were exempted from filling the questionnaire due to difficulty that may be encountered in understanding and filling the questionnaire, as such they are exempted. Forty-two (42) 24.7 % out of the one hundred and seventy (170) pupils who filled out the questionnaire were infected. In assessing their knowledge of Geohelminthiasis, 49 (28.8%) said they had not heard of the word Geohelminths while 121 (71.2%) said they had heard of it. In assessing the cause of helminthiasis, the majority of the pupils 77 (45.3%) said is caused by bacteria, 24 (14.1%) said is caused by a parasite, 12 (7.1%) said is caused by a virus, 6 (3.5%) said is cause fungi, 2(1.2%) said they don't know and 49 (28.8%) gave no response. In assessing their knowledge of transmission, 98 (57.6%) said the transmission was through faecal-oral, 21% (12.4%) said it was through the contaminated needle, 33 (19.4%) said it through insect bite and 18 (10.6%) said it's through skin penetration. In assessing their knowledge of prevention, 32 pupils (18.8%) said intestinal helminthiasis can be prevented through vaccination, 15 (8.8 %) said through bathing with soap and water, 115 (67.6%) said through personal hygiene/environmental sanitation, 5(2.9%) said through the washing of clothes and 3(1.8%) said they don't know. In assessing their knowledge of treatment, 49 (28.8%) said flagyl is used for the treatment of intestinal helminthiasis, 1 (0.6 %) said paracetamol/Panadol is used for the treatment, 112 (65.9%) said the use of antihelminthic drug, 2 (1.2 %) said by the use of herbicides, 4 (2.4 %) said by the use of pepper and 2 (1.2 %) said they don't know.

Table 5: The Pupil's Knowledge on Geohelminths

Characteristics	Response (%)	χ^2-value	p-value
Have you heard of Geohelminths?			
No	49 (28.8)		
Yes	121 (71.2)		
Causes		155.405	0.000*
Virus	12 (7.1)		
Parasite	24 (14.1)		
Bacteria	77 (45.3)		
Fungi	6 (3.5)		
Don't know	2 (1.2)		
No answer	49 (28.8)		
Mode of Transmission of Geohelminthiasis		99.600	0.000*
Faeco-oral	98 (57.6)		
Contaminated needle	21 (12.4)		
Insect bite	33 (19.4)		

Skin penetration	18 (10.6)		
Prevention		256.706	0.000*
Vaccination	32 (18.8)		
Soap and water	15 (8.8)		
Personal hygiene / Environmental sanitation	115 (67.6)		
Washing of clothes	5 (2.9)		
Don't know	3 (1.8)		
Treatment		358.353	0.000*
Use of flagyl	49 (28.8)		
Use of Paracetamol / Panadol	1 (0.6)		
Use of anti-helminthic drugs	112 (65.9)		
Use of herbicides	2 (1.2)		
Use of pepper	4 (2.4)		
Don't know	2 (1.2)		
Have you taken anti-helminthic drugs before?			
No	0 (0.0)		
Yes	170 (100.0)		
If yes, when?			
5 years ago	0 (0.0)		
2 years ago	0 (0.0)		
1 year ago	170 (100.0)		
A few months ago	0 (0.0)		

(P<0.05 (*) is statistically significant)

Discussion

Our study revealed the prevalence of intestinal helminthic infections as 22.6%, which is the prevalence of the ova of hookworm, Ascaris lumbricoides, Taenia spp. and Schistosoma mansoni were recovered among the infected pupils. The overall prevalence was found to be higher than the one obtained by Kuboye, Nock, Aken'oven & Ndams, in 2017 (6.67%). The higher prevalence reported when compared with the work of Kuboye et al., 2017 may be due to indiscriminate defecation, walking barefooted and improper refuse disposal observed in the study area. The study also showed that hookworm has the highest occurrence followed by Ascaris lumbricoides and Taenia spp. while Schistosoma mansoni had the least prevalence. The highest Occurrence of hookworm in the study area agrees with the findings of Anosike, Zaccheaus, Adeiyongo, Abanobi, Dada, Keke, Uwaezuoka, Amajuoyi, Obiukwu, Nwosu, & Ogbuju (2006). Moreover, our findings disagreed with the work of Olusola, Francis, Adekunle, Babatunde & Oluwaseyi (2010). Their work in a Tertiary Institution in Western Nigeria reported Ascaris lumbricoides to have the highest prevalence of 12.7%, this may be due to location differences. The presence of four (4) intestinal helminths namely; Hookworm, Ascaris lumbricoides, Taenia spp. and Schistosoma mansoni in the study area conform with the finding of Kuboye et al., 2017 in Zaria, this may be due to same environmental condition. The prevalence according to Age indicated that Pupils of 3-5 years had the lowest prevalence while 15 years and above had the highest prevalence. The highest prevalence seen among pupils of the age range 15 years and above disagreed with the findings of Ezeagwuna, Okwelogu, Ekejindu, & Ogbuagu (2010), who reported a high prevalence among pupils of age 9-13 years. The lowest infectivity rate reported among pupils of age 3-5 years, was not in agreement with the findings of James, Patricia, Paul, Emmanuel & Bryan (2010), who reported the lowest prevalence rate among pupils aged 13-15 years. The lowest prevalence reported among pupils of 3-5 years may be due to good care from parents and nannies, who prevent them from coming in contact with contaminated materials like soil and unwashed fruits/vegetables. Furthermore, our study was not in agreement with the findings of Chigozie, Kelvin, Patrick, Nelson & Emmanuel (2007), in which the highest infectivity was reported among pupils of age 4-6 years. The prevalence of Geohelminths about class showed that pupils in primary four (4) have the highest infection, followed by those in primary two (2) and three (3) with equal prevalence rates, then primary one (1) had the least prevalence. There was the highest occurrence of Ascaris lumbricoides among pupils of primary 2 while no report of Ascaris infectivity among pupils in primary 5. There was the highest occurrence of hookworm infection among pupils of primary 4 while the lowest hookworm infection was reported among pupils of primary two, the highest infection with Taenia was reported among pupils of primary 2 while no Taenia infectivity was found among primary 4 pupils. This could be due to the fact that they are older and independent. The highest infectivity with Schistosoma mansoni was reported among pupils of primary 4 while no infectivity was reported among pupils of primary 6. The lowest infectivity rate reported among those in primary one pupils may be due to good care from parents and nannies thereby reducing their contact with contaminated objects like soil, unlike others moving around with little or no restriction and exposing themselves to contaminated environment. The high infectivity rate reported among the pupils in primary four may be due to a high level of soil contact activity and a lack of practice of proper personal hygiene among the pupils. Infectivity based on gender showed male pupils was more infected than female pupils. Females have a higher infectivity of Ascaris lumbricoides than males. While males have a higher infectivity of Hookworm, Taenia and Schistosoma mansoni than females. Higher infectivity reported among males may be because, male pupils are mostly active and engaged in many activities such as farming, swimming and other outdoor activities than the females thereby exposing them to these parasites. Also, our findings agreed with that of James et al., 2010, who in their research in Jos, Plateau State, Nigeria, reported high prevalence to exist among male pupils (13.6%) than females (11.9%). Futhermore, our findings was also similar with the findings of Ugbomoiko, Onajole, & Edungbola, (2006), which reported a higher prevalence among males (5.4%) than females (3.0%). However, the work disagreed with that of Kuboye et al., (2017), who reported a higher prevalence in females than males (8.56% and4.62%) repectively. Also, Anosike et al., (2006), reported a higher prevalence among females (39.3%) than males (34.5%). The difference in the level of knowledge on the cause of Geohelminthiasis was statically significant ($p<0.05$). Indicating bacteria as the cause of Geohelminthiasis may be because, bacteria is the most pronounced organism in our community today, and every ailment people always thought is caused by bacteria, this could be the reason why majority of the children thought intestinal helminthiasis is caused by bacteria. The difference in the level of knowledge on transmission of Geohelminths was statistically significant ($p<0.05$). The difference in the level of knowledge on the prevention of Geohelminthiasis was statistically significant ($p<0.05$). The majority of them got it right, this may be due to health education as a subject being taught in the school which helps them to know preventive measures against diseases. The difference in the level of knowledge on the treatment of Geohelminths was statistically significant ($p<0.05$). The majority of the pupils got it right that antihelminthic drugs are used for the treatment of Geohelminthic infection, this may be due to mass deworming campaigns by non-governmental organizations such as Sight savers, UNICEF, WHO and the Ministry of Health. The fact is not far fetch when some said flagyl is used, this is simply because helminthiasis is associated with stomach pain and our common drug for treating stomach pain is Flagyl. Some chosen peppers may be due to the belief in our communities that, pepper can be used for deworming. Some choosing herbicides may be due to frequent usage of this chemical for weeding by their parents who are mostly farmers and thought it can also be used to treat Geohelminthes. All the pupils said they had taken antihelminthic drugs about a year ago, this is due to a massive campaign by government and non-governmental organizations to deworm children from time to time so as to reduce the prevalence of Geohelminths in Kaduna State, North-West Nigeria

Conclusion

Our study from Kaduna revealed that Geohelminthiasis is still prevalent among primary school pupils of different ages and genders and despite the efforts by the Ministry of Health and Non-Governmental Organizations to deworm children from time to time. Intensive health education, provision of pipe-borne water, improved environmental sanitation and continuous deworming campaigns in this community were recommended so as to help mitigate the continuous increase in the prevalence of this infection in Kaduna State and Nigeria as a whole.

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The authors declare that there is no conflict of interest.

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