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Prevalence of Geohelminth Infections Among Primary School Children in Liman Katagum Area of Bauchi State, Nigeria.

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ABSTRACT

*Geohelminth infections remain a significant public health challenge in Nigeria, disproportionately affecting children, who are the most vulnerable population. Previous studies have consistently reported high prevalence rates among primary school-aged children across the country. This study aimed to assess the prevalence of geohelminth infections in selected primary schools within the Liman Katagum area of Bauchi State, Nigeria, and to identify associated risk factors contributing to infection. A total of 384 fecal samples were collected from primary school children and analyzed using the Formol-ether concentration technique to detect the presence of geohelminth eggs. Statistical analysis was performed using the chi-square test to determine associations between infection rates and various demographic and behavioral factors. The findings revealed a moderate prevalence of geohelminth infections at 24.2%, with male children exhibiting a slightly higher infection rate (56.9%) compared to females (43.0%). However, the difference in prevalence between genders was not statistically significant ($p > 0.05$). Among the identified geohelminths, *Ascaris lumbricoides* was the most prevalent species (13.1%), followed by Hookworm (6.1%), *Trichuris trichiura* (5.1%), *Strongyloides stercoralis* (1.5%), and *Enterobius vermicularis* (1.0%). Age-specific prevalence showed that children aged 9–10 years had the highest infection rate at 28.8%, whereas children aged 5–6 years exhibited the lowest rate at 19.3%. The differences in prevalence between age groups were statistically significant ($p < 0.05$), indicating that age may be a contributing factor to susceptibility. Behavioral and environmental factors such as the source of drinking water, playing habits, defecation practices, handwashing habits before and after using the toilet, wearing footwear, and trimming fingernails were also evaluated. However, no significant associations were found between these factors and the prevalence of geohelminth infections. To mitigate the burden of geohelminth infections in the area, several public health interventions are recommended. These include implementing regular school-based deworming campaigns, enhancing public health awareness programs targeting both children and their caregivers, and promoting improved environmental and personal hygiene practices. These measures are critical for reducing infection rates and minimizing the associated health impacts on affected children. This study underscores the importance of sustained efforts to combat geohelminth infections, particularly in resource-limited settings where children remain at heightened risk. Future research should explore additional factors contributing to infection dynamics and assess the long-term effectiveness of intervention programs.*

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INTRODUCTION

Geohelminth infections are widely distributed throughout the world but mortality and morbidity rates of these infections are most significant in developing countries. People in the developing nations experience a cycle where malnutrition and infections lead to excess morbidity that can continue from generation to generation. Infections are mainly transmitted via ingestion of water, food or soil contaminated by faeces containing the eggs or larvae of these helminths. Thus, these parasites are referred to as “geohelminths” because they are transmitted through faecal pollution of soil which subsequently contaminates food or water. (Saki *et al.*, 2012).

These geohelminths thrive where there is ignorance and poverty. Those mostly affected are the poorest populations, living in remote, rural areas, in urban slums or in conflict zones. These geohelminth infections are known to cause iron-deficiency anaemia, growth retardation in children, intestinal obstruction and some other physical and mental health problems. Control of these worms is clearly desirable but it must be based on a thorough understanding of the disease burden. It is for this reason that we present here the prevalence of geohelminth infections among school children in Liman Katagum area of Bauchi State.

MATERIAL AND METHODS

Description of the Study area

The study area (Liman Katagum) lies between latitude 10° 0' 28"N and longitude 9° 46' 29"E and is about 50 km south of Bauchi the state capital. The natural vegetation is mainly Sudan Savannah and its inhabitants are mostly farmers, herdsmen, traders and civil servants. The population of the area is 740,102 people as per the 1996 population figure (Anonymous, 2006). It has an average altitude of 548m (1,798 feet) above the sea level and the annual rainfall is about 700mm. Temperature in the zone ranged from 36.9°C to 38.3°C. There are shallow ponds but there is no river. It has one central market, a General Primary Health Care Center called Kailani, an Area Court and two Primary Schools of which one is the LGA Central Primary School and the other Ibrahim Maikafi Primary School. There are also two secondary

schools; a boarding Girls Secondary School and a day Boys and Girls mixed Secondary School which comprises of Junior and Senior Section.

Sample collection

Two primary schools namely Central primary school and Ibrahim Maikafi Primary School were selected for the study. 384 school children of both gender within the ages of 5-12 years irrespective of their level of study were randomly selected and recruited for the study. The children were split into four age groups 5-6, 7-8, 9-10, 11-12 years for the study.

Fresh stool samples were collected from these children in sterile specimen bottles with names and ages of the children. Stool samples were then preserved in 10% formalin and transported to laboratory where they were processed using formol- ether concentration techniques and examined microscopically as described by Cheesbrough (2015). Geohelminth eggs encountered were identified on the basis of morphological characteristics in accordance with the key of Cheesbrough (2015). Furthermore, structured questionnaires were administered to obtain information on various socio-demographic data and associated risk factors of acquiring geohelminths infection.

Data analysis

Data obtained on prevalence of various geohelminths were analyzed using Chi-square analysis on SPSS computer software version 22 of 2021 and differences in prevalence between gender and age groups were measured at 95% confidence levels.

RESULTS

Of the 384 stool samples screened, 93 (24.2%) were found infected with geohelminths. A total of five (5) geohelminths parasites were encountered during the study. The prevalence of these is shown in table 1. While *Ascaris lumbricoides* was the most prevalent, *Strongyloides stercoralis* was the least occurring parasite. The differences observed in the prevalence of these five parasites was statistically significant ($p < 0.05$).

Table 1: Prevalence of geohelminth parasites recovered from the Primary School Children screened during the study

Parasite	No +ve	Prevalence %
N=384		
<i>Ascaris lumbricoides</i>	51	13.3
<i>Trichuris trichiura</i>	16	4.1
Hookworms	12	3.1
<i>Enterobius vermicularis</i>	10	2.6
<i>Strongyloides stacoralis</i>	4	1.0
$X^2_{cal} = 45.5781$ $X^2_{tab} = 9.488$ $df=4$ $P \text{ value} = 0.001$ $\therefore p < 0.05$		

The gender-based prevalence of infection was shown in Table 2 and it revealed that out of the 198 males examined 53 (26.8%) were found to be infected with different types of parasites while of the 186 females screened, 40 (21.5%) were infected. This difference was however not statistically significant ($p > 0.05$).

Table 2: Gender based prevalence of infection among school children examined during the study

Gender	No Exam.	No +ve	Prevalence %
Male	198	53	26.8
Female	186	40	21.5
Total	384	93	24.2
$X^2_{cal} = 1.23$ $X^2_{tab} = 9.488$ $df=1$ $p = 0.305$ $\therefore p > 0.05$			

Age-wise distribution of infection is depicted in Table 3 where the 9-10 years old were the most infected whereas the 5-6 years old were the least infected. The difference between the age groups was statistically significant ($p < 0.05$)

Table 3: Prevalence of infection in primary school children screened based on age-group

Age group (Years)	No Exam.	No +ve	Prevalence %
5-6	102	20	19.6
7-8	98	22	22.4
9-10	94	27	27.6
11-12	90	24	26.7
Total	384	93	24.2
$X^2_{cal} = 20.34$ $X^2_{tab} = 16.919$ $df=3$ $p = 0.017$ $p < 0.05$			

DISCUSSION

The overall prevalence of 24.2% for geohelminth parasites recorded in this study was moderate when compared with the finding of Thomas *et al.*, (2014) who reported a prevalence of 15% in Chikun, Kaduna South local government area Kaduna State. It is however, lower than Babatunde *et al.*, (2013) who recorded a prevalence of 59.2% in Kwara State, Nigeria. The findings of the study further

agree with Elias *et al.*, (2016) who reported a prevalence of 25.6% from rural Enugu State. The moderate prevalence of geohelminth parasites in this study could be attributed to improve in personal hygiene as most of the children examined have little health education with fairly family background and socio-economic status that limit the transmission of these parasites. In addition, the moderate prevalence rate could be due to improve in the

type of contaminated and unhygienic food eaten by the children, contact with contaminated playing ground and the state of facilities like toilets, water source among others in the schools (Chigozie *et al.*, 2007). The geohelminth parasites found in the present study are *Trichuris trichiura*, Hookworms, *Enterobius vermicularis*, *Strongyloides stercoralis* and *Ascaris lumbricoides* being the most observed parasite.

The high prevalence of *Ascaris lumbricoides* in this present study may be associated with the unhygienic habits or contaminated food eaten by the children gotten from the playing ground or facilities like the toilets. The ova of *Ascaris* can survive adversely ecological conditions and is an indication of faecal contamination as most children defecate indiscriminately in the backyards and bushes around dwelling places due to lack of latrine facilities. The finding agrees with Holland *et al.*, (2022). However, it is in contrast with Galgamuwa *et al.*, (2016) who reported that Children who did not eat food picked up from the ground were about two times at lower risk of being infected with *Ascaris*.

The low prevalence of *Trichuris trichiura* obtained in this present work may be linked with improved socio-economic development that prevent the transmission of this parasites. It may also be attributed to the good health education among the children (WHO, 2024). It is in contrast with Gyang *et al.*, (2017) who reported that infection is acquired by faecal-oral route.

Hookworm is the third most observed parasite among the study participants. It could be attributed since most of the children play barefooted and this might expose them to hookworm larvae infective stage. Moving without wearing protective shoes is common among school children in public schools in Nigeria. This finding agrees with Tyoalumun *et al.*, (2016). However, the finding contrast the report of Ukoli (2001) that infection is due to warmth, moisture shade and optimum temperature which are suitable environmental conditions for the survival of hookworm eggs.

The occurrence of *Enterobius vermicularis* as the fourth parasite in the present study seems relatively low. The low prevalence may be connected with improved personal hygiene of the school children which include washing of hands before eating and after using the toilet and finger sucking or keeping finger nails short, bathing habits, household cleaning and living conditions which may decrease the infection rate Oluwayemisi *et al.*, (2022). In contrast, other reports showed the risk factors of pinworm infection associated with age, bed linens, parent occupation and educational level Fan *et al.*, (2019).

Strongyloides stercoralis was the least parasite encountered. The low prevalence is likely to be linked with influence of season on infection by the parasite low grade infectious are commonly reported during dry season, and this correspond with time this study was conducted. This finding agrees with Tefere *et al.*, (2019). However, it is in contrast with the report of Holland *et al.*, (2014) that prevalence is likely to be linked with its susceptibility to adverse environmental conditions, its alternating mode of infestation and auto-infection

The infection rate as identified was higher among males than females although, there was no significant difference ($p > 0.05$) between infection rate and gender. This indicates that both genders are susceptible to the infection. This finding agrees with Ekpenyong and Eyo (2008) and that of Ihesiulor *et al.*, (2019) who reported that geohelminth parasite infections was not gender biased. Also intestinal parasitic infection was found to be equal among males and females. The study however, contradict the work of Agbo *et al.*, (2019) who reported that prevalence of intestinal parasite was higher among females than males.

The infection with the geohelminths was higher among the age group of 9-10 years while the age group 5-6 years were least affected, and there was a statistically significant association between the age and infection in the current study. This is similar to the work of Ihesiulor and Ahmad *et al.*, (2015) who reported that intestinal parasites were age dependent. However, it is in contrast with Adeyebe and

Akinlabi (2002) who reported that infection was significantly associated with lower age group.

CONCLUSION

Intestinal parasites have been found to be endemic in Liman Katagum area based on this study. These parasites are known to have various effects on the human hosts. Therefore, there is a strong need to control them. This can be achieved through treatment with effective drugs against these parasites. Other control measures like good personal hygiene, and proper sanitary disposal of faeces will facilitate to curb the menace.

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