



## Science Forum (Journal of Pure and Applied Sciences)

Journal Homepage: <https://atbuscienceforum.com.ng/index.php/jpas>



### Survey of Geohelminth Parasites in Soils of Some Selected Motor Stations in Bauchi Metropolis, Bauchi State, Nigeria.

**Ibrahim Amina Abdullahi, Sam Mao Panda, Adamu Babayo Samaila**

Biological Sciences Department, Abubakar Tafawa Balewa University, Bauchi State, Nigeria

#### Abstract

Geohelminth infections remain a major public health concern, particularly in developing nations where poor sanitation facilitates transmission. Common species such as *Ascaris lumbricoides*, *Trichuris trichiura*, hookworms, and *Strongyloides stercoralis* predominantly affect children in tropical and subtropical regions. This study evaluated the diversity and contamination levels of geohelminth parasites in soils from three major motor parks in Bauchi Metropolis, Nigeria, while also assessing environmental risk factors. Soil analysis revealed average physico-chemical parameters, including a temperature of 24.29°C, slightly alkaline pH (8.17), low moisture content (0.51%), and a predominance of sandy loam soil—conditions that may influence parasite survival. Using floatation and sedimentation techniques, 180 soil samples were examined, revealing an overall contamination rate of 30.55%. Muda Lawal Motor Park had the highest prevalence (43%), followed by Yankari (31.6%) and Awala (16.7%). Statistical analysis (Chi-square) indicated significant variation in contamination levels across the parks ( $p < 0.05$ ). Among the detected parasites, *Ascaris lumbricoides* was most frequent (25.5%), followed by *Strongyloides stercoralis* (21.8%), hookworms (20%), *Enterobius vermicularis* (18.2%), and *Trichuris trichiura* (14.5%). These findings confirm moderate soil contamination with geohelminth eggs, posing infection risks to humans, particularly children and frequent park visitors. Contributing factors likely include poor sanitation and open defecation. Public health interventions, including improved hygiene education, sanitation enforcement, and periodic deworming, are recommended to mitigate transmission risks in these high-traffic areas.

#### Keywords

Geohelminths;  
Parasites;  
Motor stations;  
*Ascaris lumbricoides*;  
Bauchi metropolis

## INTRODUCTION

Geohelminths are group of intestinal parasites belonging to the class nematoda that are transmitted primarily through contaminated soil. They are called soil transmitted helminths (STH) because they have a direct life cycle which requires no intermediate host or vector, and parasitic infection usually occurs through fecal contamination of soil, food stuff and water supply (Ndenecho et al., 2002). Geohelminths infection is most prevalent in tropical and sub-tropical regions of the world, where adequate sanitation is lacking. These infections have a worldwide distribution, being present in almost all geographic and climatic regions, except for those in extreme cold or heat, where survival of infectious stages in the environment is impossible (Brooker et al., 2006).

Geohelminths prevalence tends to be highest in warm and moist climate and it is closely correlated with poor environmental hygiene, especially particular lack of adequate excreta disposal, ignorance and poverty. Many motor parks are located in this major city. 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. Motor stations may become a reservoir of these parasites because of the activities that are taking place such as open defecation. Unfortunately, there is no reliable parasitological study on the survey of these geohelminth parasites in motor stations in

Bauchi metropolis. Therefore, this study aimed to assess the diversity of geohelminth parasites in Bauchi metropolis, Bauchi State.

## MATERIALS AND METHODS

### Description of the Study area

Bauchi Metropolis is located in Bauchi State, Nigeria, between 9°00' and 9°30' north of the equator and 10°25' and 11°20' east of the Greenwich meridian. It is the administrative center of Bauchi State. It is located on the northern edge of the Jos Plateau. It is about 128 km northeast of Jos and 150 km west of Gombe town. Bauchi State is located in the northern part of Nigeria. The state is bordered by Kano, Jigawa, Taraba, Plateau, Gombe, Yobe, and Kaduna. The state is divided into the Sudan savannah in the south and the Sahel savannah in the north and its inhabitants are mostly civil servants and traders. The population of Bauchi city in 2022 was 881,600 as per the 1996 population figure (Anonymous, 2006).

It has an average altitude of 616 meters (2,021 feet) above the sea level and the annual rainfall is about 2,284.5mm. Temperature in the zone ranged from 36.9°C to 38.3°C. Bauchi also has a number of dams for irrigation and other purposes, these include Gubi dam. There are number of motor stations in Bauchi town which includes, Yankari motor station, Muda Lawal, Awala, Total, Tirwun etc.

### Sample collection

Three motor stations namely; Yankari motor station, Muda Lawal motor station and Awala motor station were selected for the study. 180 soil samples were randomly selected and examined for the study.

Soil samples were collected from these motor stations in plastic bags and transported to

laboratory. Physico-chemical parameters were analyzed as described by Rowell (1994); Amadi and Attah, (2010). The samples were analyzed using floatation technique as described by Arora and Arora (2009) and sedimentation method as described by Cheesbrough (2006). Geohelminth eggs encountered were identified on the basis Of morphological characteristics in accordance with the key of Cheesbrough (2015).

#### DATA ANALYSIS

Data obtained for physico-chemical parameters were analyze using two-way Anova

and those for geohelminths were analyzed using Chi-squire on SPSS computer software version 22 of 2021.

#### RESULTS

Physico-chemical parameters examined in the three motor stations were soil temperature, pH, moisture content and soil types. Table 1 and 2 showed the overall results obtained, were temperature have an average mean of 24.29, pH with average mean 8.17, and an average moisture content of 0.51 and mostly has sandy loam type of soil.

• Table 1: Physico-chemical Parameters of Soils in the Selected Motor Stations

Motor Stations	Points of Samples Collected		Physico-Chemical Parameters	
	Sites/Points	Temperature (°C)	pH	Moisture (%)
Yankari	A	24.0	8.0	0.617
	B	24.2	7.9	0.383
	C	24.0	8.0	0.000
	D	24.5	8.2	0.613
	E	24.1	8.6	0.815
Muda Lawal	A	24.3	7.9	0.201
	B	24.2	8.0	0.405
	C	24.3	8.1	0.410
	D	24.5	8.5	0.215
	E	24.6	8.1	0.408
Awala	A	24.2	8.3	0.581
	B	24.2	8.3	2.655
	C	24.3	8.1	0.000
	D	24.1	8.4	0.000
	E	24.3	8.3	0.209

Key: A=Parking lot, B= Close to Mosque. C= Close to Food vendors, D= Close to Office, E=Close to Conveniences

• Table 2: Percentage (%) Composition and Soil Types in the Selected Motor Stations

Motor Station	Points of sample collected	Type of Soil	Percentage (%) of Soils Composition		
			Sand	Silt	Clay
Yankari	A	Sandy	64	21	7
	B	Sandy loam	50	33	16
	C	Sandy loam	68	15	5
	D	Loamy sand	70	23	6
	E	Sandy loam	56	37	7
Muda Lawal	A	Sandy loam	56	20	10
	B	Loam	36	45	18
	C	Sandy loam	58	17	16
	D	Sandy loam	69	20	11
	E	Loamy sand	72	18	9
Awala	A	Sandy loam	61	27	11
	B	Sandy loam	63	18	18
	C	Sandy clay loam	66	25	8
	D	Sandy loam	60	20	13
	E	Sandy loam	58	25	16

Key; A=Parking lot, B= Close to Mosque. C= Close to Food vendors, D= Close to Office, E=Close to Conveniences

Of the 180 soil samples examined from the month of December 2023 to February 2024, 55 (30.55%) were found infected with geohelminths. The prevalence of these is shown in table 3. Based on the

monthly distribution, the differences observed in the prevalence of these motor stations was statistically significant ( $p < 0.05$ ).

Table 3: Monthly Distribution of Geohelminth Parasites Recovered In The Selected Motor Stations From December 2023-February 2024.

Motor station	Samples examined N=180	Positive(+ve) samples N=55	Months			Percentage (%)
			December	January	February	
Yankari	60	19	6	5	8	19(31.6)
Muda Lawal	60	26	8	12	6	26(43.3)
Awala	60	10	4	3	3	10(16.6)
Total	180	55	18	20	17	55(30.55)

$\chi^2_{cal} = 12.814$ ,  $df=4$ ,  $\chi^2_{tab}=9.488$ ,  $p=0.02$ , significant at 5% level of  $\alpha$

A total of five (5) geohelminths parasites were encountered during the study. The prevalence of these is shown in table 2. While *Ascaris lumbricoides* 14(25.5%) was the most prevalent, *Trichuris trichiura* 8(14.5%) was the least occurring parasite. The differences observed in the prevalence of these five parasites was not statistically significant ( $p<0.05$ ).

Table 4: Species Specific of Geohelminths Parasites Recovered In Soils of Selected Motor Stations

Parasites	Positive (+ve) samples N=55	Percentage(%)
<i>Ascaris lumbricoides</i>	14	25.5
<i>Hookworms</i>	11	20
<i>Strongyloides stercoralis</i>	12	21.8
<i>Enterobius vermicularis</i>	10	18.2
<i>Trichuris trichiura</i>	8	14.5
Total	55	100

$\chi^2_{cal} = 1.82$ ,  $df=4$ ,  $\chi^2_{tab}=9.488$ ,  $p=0.769$ , not significant at 5% level of  $\alpha$

Among the three motor stations, Muda Lawal had the highest prevalence rate of 43.3%, followed by Yankari with 31.6% and Awala motor station with the least prevalence 16.7%. Table 5 showed that the differences observed in the prevalence of these motor stations was statistically significant ( $p<0.05$ ).

• Table 5: Comparison of Geohelminth Parasites Recovered in Soils of Selected Motor Stations

Motor station	No examined N=180	Positive samples N=55	(+ve) Frequency (%)
Yankari	60	19	31.6
Muda Lawal	60	26	43.3
Awala	60	10	16.7
Total	180	55	30.55

$\chi^2_{cal} = 10.107$ ,  $df=2$ ,  $\chi^2_{tab}=5.991$ ,  $p=0.015$ , significant at 5% level of  $\alpha$

## DISCUSSION

From the results obtained, the soil parameters used in the study temperature had a mean of 24.29, pH had a mean of 8.17, and average moisture content of 0.51 and mostly had sandy loam type of soil. However, from the results no significant effects were observed between levels of motor stations and samples for temperature, pH and moisture. Soil types had no effect in the distribution of geohelminths.

Although studies suggest that the eggs of *Ascaris* species develops best in less permeable clay soil with survivability rate increasing with depth (Beaver, 1975), clay soil are also believed to prevent dispersal by water, however well aerated non adhesive sandy soil are particularly conducive to promoting hookworm

hatching, development and larval migration (Ogunrinola and Adepega 2012).

It has been established that five species of human geohelminth eggs can be found in all the three motor stations sampled. Yankari motor station had a prevalence of 31.6%, Muda lawal 43.3% and Awala 16.7%. Table 3 clearly showed Muda Lawal motor station having highest prevalence value and Awala with least prevalence value which was statistically significant ( $p>0.05$ ).

Muda Lawal having highest prevalence can be attributed to having one of the major markets around the motor station, many residential areas around the area and different business activities that are taking place around the area such as food vendors, restaurants, mosque, parking lots, open defecation around the area

which results in the contamination of the soil. In areas where refuse are disposed indiscriminately, and where toilet facilities may not be adequately provided, soil contamination might occur (Agbolade et al., 2007).

Table 4 showed the prevalence of parasites in the soil sample, where *Ascaris lumbricoides* had the highest prevalence value of 25.5%, followed by *Strongyloides stercoralis* with 21.8%, hookworms with 20%, *Enterobius vermicularis* with 18.2%, while *Trichuris trichiura* had least prevalence of 14.5%. High prevalence of *Ascaris lumbricoides* in this study is in agreement with findings of other studies in Delta and Anambra states, southern Nigeria Ogbe et al., (2004); Egwuyenga et al., (2004); Chukwuma et al., (2009), Mobolanle and Oluwasejum (2021) and lower to the work of Okwaet et al., (2023) who reported 30.2% prevalence in Ojo Local Government Area in Lagos. *Ascaris lumbricoides* can withstand harsh environmental conditions and can remain in the environment for longer period.

The second most prevalent geohelminth parasite from this study was Hookworms with prevalence value of 21.8%, this could be as a result of open field defecation practices, poor personal and in adequate environmental hygiene Aschalewet et al., (2022), the larva of hookworms are capable of vertical migration up and down

in contaminated soil, depending on soil moisture and temperature and they remain in the soil until they come in contact with suitable host Ndenecho et al., (2002), followed by *Strongyloides stercoralis* 20%, *Enterobius vermicularis* with prevalence value of 18.2%, and this result is low compared with the values from other studies in various parts of Nigeria. Ngele (2008) reported infection rates of 58.3% in Ubeyi Ebonyi state and Obiukwu et al., (2008) in Mbaukwu, Anambra state recorded 31.1%. *Trichuris trichiura* had the least prevalence with 14.5%.

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 temperature 52°C to 54°C for a shorter time than *Ascaris lumbricoides* eggs (Mohammed, 2010).

## CONCLUSION

The study showed that soils from the selected motor stations are moderately contaminated with some of these geohelminth parasites and these parasites are known to have various effects on the human hosts. Therefore, there is a strong need to control them. The local authorities need to construct safe, functional and easily accessible toilet facilities to curb the menace. However, the knowledge from this research work can be used by health



workers in planning and evaluating of health intervention programs.

## RECOMMENDATION

- People in the area should avoid walking barefooted since they are ignorant of the disease.
- People in the area should be enlightened on the importance of proper waste disposal practice.
- Open defecation should be discouraged around the areas.

## ACKNOWLEDGEMENT

We are grateful to the managements of Yankari, Muda Lawal and Awala motor stations. We are also grateful to the Department of Biological Sciences, Abubakar Tafawa Balewa University, Bauchi for the provision of laboratory facilities which aided this work.

## REFERENCES

Agbolade JF, Adefioye OA, Adeyeba OA. (2007). Hookworm Infection among School Children in Vom, Plateau State, Nigeria. *America Eurasian Journal of Scientific Research*. 2(1):39-42.

Amadi EC, Ettah EC. (2010). Impact of physicochemical factors of contaminated foci on the survival of geohelminths in Abua Communities, Niger Delta Nigeria. *J. Appl. Sci. Environ. Manage*; 2010.

Arora DR, Arora B. (2009). *Medical Parasitology*. 2nd ed. New Delhi. Bangalore India. CBS Publishers and Distributors. 220-21.

Aschalew, H., Megbaru, A. and Animen, A. (2022). Soil Contamination and Infection of School Children by Soil-Transmitted Helminths and Associated Factors at Kola Diba Primary School, Northwest

Ethiopia: An Institution-Based Cross-Sectional Study. *Journal of Tropical Medicine*. Beaver PC. (1975). Biology of soil-transmitted helminths: The massive infection. *Health Lab Sci*. ;12:116-125.

Brooker S, Clements A, Bundy DAP (2006). Global epidemiology, ecology and control of soil-transmitted helminth infections. *Adv Parasitol* ;62:223-265.

Cheesbrough M. (2015). *District Laboratory practice in tropical countries*. Part 1 Cambridge University press,; .191-217, 239-258.

Chukwuma MC, Ekejindu IM, Agbakoba NR, Nwosu DC. (2009). The prevalence and risk factors of Geohelminth infections among primary school children in Ebenebe Town, Anambra state Nigeria. *Middle-East J. Sc. Res*;4(3):211-215.

Mobolanle, O., O. and Oluwasegun, J., J. (2021). Prevalence of soil-transmitted



helminthiasis among primary school pupils in Ipogun, Ondo State, Nigeria. *Journal of Parasitology and Vector Biology*, 13(1): 35-40

Mohammed, F. (2010). The prevalence of *Toxocara* eggs in the soil of Abuja Recreational Park and gardens. M. Sc thesis submitted to ABU Zaria. Pages 5-23

Ndenecho L, Ndamukong KJ, Matute MM (2002). Soil transmitted nematodes in children in Buea Health District of Cameroon. *East Afr. Med. J.* 2002;79(8):442-445.

Ogbe MN, Edet EE, Isichel NN. (2002). Intestinal Helminth infection in primary School Children in areas of operation of shell petroleum development company of Nigeria (SPDC) western division in Delta State. *The Nig. J. Parasitol.* 2002;23:3-10

Ogunrinola IO, Adepega EO. (2012). Health and economic implications of waste dumpsites in cities: The case of Lagos Nigeria. *International Journal of Economics and Finance.*;4(4).

Rowell, D. (1994). Soil science. Methods and Application, Longman Scientific and Technical;