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Survey of Geoparasites Species Diversity in some Selected Dumpsites in Lapai Town, Niger State, Nigeria

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ABSTRACT: The growth of human population and rapid industrialization has led to the increasing use of urban land as dumpsites, compromising their other uses. The disposal of waste on land has led to alterations in the quality and ecology of soil. The present study assessed parasites species diversity in some selected dumpsites in Lapai town. Studies were conducted for a period of Nine months, from January, 2020 to September 2020 using standard methods of parasites identification to differentiate the parasite seen. Out of 432 samples examined, 222 parasites seen were, *Ascaris lumbricus* (45.59%). *Taenia solium* (26.70%), *Strongiloides stercolaris* (14.86%). *Gardia lambia* (1.01%) *Enterobius vermicularis* (1.01%) *Fasciola hepatical* and *Trichuris trichura* (1.26%), *Ancylostoma duodenale* (3.78%) There was a significant difference ($P<0.05$) in species diversity of parasites in dumpsites. Findings call for an improvement in the basic environmental and sanitary conditions, adequate waste management services and health education on personal hygiene.

Keywords: Geoparasites, diversity, species, dumpsites

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INTRODUCTION

Soil is a highly dynamic, ecologically complex and diverse living entity that is formed as a result of various biological and climatological interactions with the earth's bedrock. Soil pollution is a phenomenon characterized by the loss of the structural and biological properties of the soil layers as a result of numerous human and natural factors. Human activities that cause pollution include increased urbanization, disposal of untreated waste, indiscriminate use of agrochemicals unscientific mining, dumping of industrial waste, accidental pollution and leakages, inadequate treatment and safety management of chemicals and toxic waste. As urbanization increases and human population grows, there is a need to manage the waste produced from human activities and this had led to the creation of dumpsites. Dumpsites are waste depositing land (soil) areas where uncontrolled waste disposal activities occur in such a way that the environment is not protected from the detrimental effect that arises from these activities. The ecological balance of any ecosystem gets affected due to the widespread contamination of the soil. The generation and disposal of refuse in the world and Nigeria in particular has become a major concern today (Bartone, 2000). Modebe *et al.* (2011) reported that the battle against harmful consequences of unguided refuse collection, disposal and the attainment of clean healthy environment in Nigeria has lost its ground, It has become a common sight in Nigeria today to see heaps of festering refuse dumps in our urban and commercial cities. These wastes are aesthetically unpleasant, constitute eyesores, produce unpleasant odours especially when their organic compositions are acted upon by putrefying bacteria (Onyido *et al.*, 2009).The life style of most Nigerians today is a reflection of the consumption and solid waste

generation pattern they have adopted (Akinwale, 2005). This has been shown in their attitudinal problem of indiscriminate solid waste disposal in all sides of residential apartments, drains, highways, corners of major and minor streets, undeveloped plots of land by many households (Akinwale, 2005). These un-disposed refuse dumps provide breeding grounds for biological vectors such as mosquitoes and rodents, that enhance disease transmission like malaria, diarrhoea, and lassa fever which are of public health concern (Onyido *et al.,* 2009). High prevalence rate of protozoan endoparasitic infections have been reported in different communities due to illiteracy, poverty, lack of personal hygiene and government lapses in the collection, treatment and disposal of refuse in developing nations (Onyido *et al.,* 2009). Rural communities and urban slumps in developing Nations are known for persistent parasitic, bacterial and viral infections, because they lack portable water, appropriate sanitation methods, better housing, access to improved health care and better education (Gunduri and Okwuosa, 2006). In many developing countries, It has been reported that transmission of the disease(s) is usually through poor hygiene during food preparation, use of night soil for watering of crops, and raw eating of vegetables and fruits (Adewole and Ajayi, 2010).

MATERIALS AND METHODS

Study area

This study was carried out in Lapai metropolis. Lapai is the Local Government headquarter of Lapai Local Government Area, Niger State, Nigeria, adjoining the Federal Capital Territory at 9º 03' 00"N 6º34'00 "E. It has an area of 3, 051 km and a population of 110,127 at the 2006 census (Figure 1). Lapai is located east of Agaie on the road to Abuja. The area has a tropical climate with a mean annual temperature, relative humidity and rainfall of 30.20ºC, 61.00% and 1334.00mm, respectively. The climate presents two distinct seasons: a rainy season (May- October) and dry season (November – April). The vegetation in the area is typically grass dominated savannah with scattered trees. (Niger State Agricultural Developmental Project (NSADP, 2020). The study area consists of six different location of refuse dumpsite which was randomly selected for this study. The dumpsites are located at Lapai Market, Police Barack, Achitukpa, Musawari, Kobo primary School, Akuvera in Lapai town Niger State.

Experimental design

Simple randomized design was used, since the age, size and composition of these dumps differs, as some are large deposit of refuse accumulated over several years while others are smaller but more recent road side dumps.

Sample collection

Samples were gotten and classified into six(6) categories, this include; samples from Akuvera (sample A), Musawari (sample B), Police Barrack (sample C), Kobo Primary School (sample D), Lapai Market (sample E) and Achitukpa (sample F). At each location, samples were gotten from different parts, giving a specific intervalof25-30cm from the initial point of collection. Each point of collection is being marked as the same, dumpsite is revisited for another collection of sample. For each Location, sample collected include; surface of the earth and at a depth of 5 cm using the method of (Cletus, 2015). Samples were collected monthly from the month of December 2019 to the month of September 2020. Physicochemical properties of soil from the dumpsites was measured in- situ with the aid of a multipara meter by HANNA. (Temperature, Conductivity, pH) with an exception to moisture content which was analyzed in ex – situ. Soil sample (60g) was collected from each sampling sites in the morning hours between 7; 30 am and 10; 30 am. A total of 432 samples were collected from six refuse dumpsite in the study area. Each of the dumpsites was visited twice in a month for sample collection.

Sample processing

Sixty grams (60g) of soil from dumpsites was taken from each of the six refuse dumpsites was passed through a coarse sieve of 4mm 2 pore size to remove stones, grass and other undesirable materials. The preparation was transferred into a conical flask, to each flask, 50 ml distilled water was added, stirred and allowed to settle for 30 minutes. The mixture was mixed. The coarse particles were strained out by passing through a coarse mesh clothe into a centrifuge tube and centrifuged at 3000rpm (revolutions per minute) for 2 minutes. The supernatants were discarded while the sediments in each tube were stirred with parasitological sterile applicator sticks and 10 ml of Zinc sulphate floatation fluid of specific gravity of 1.3 prepared as 400g to 1000ml of distilled water was added to each test tube (Adeyeba and Akinbo, 2002). Until a slightly bulging reverse meniscus was obtained on top of the tube. A clean cover slip was placed on top of the tube to slightly touch the meniscus but was prevented from spilling over. The cover slip was left in place for an average of (2-4minutes). The cover slip was removed carefully with the adhering floatation solution that may contain ova of parasites. The cover slip was then placed faced down on a clean microscope slide (preventing bubbles) the cover slips were examined microscopically under×10,×40 and x100 objective so fare search microscope for ova of parasites (model: Olympus CH

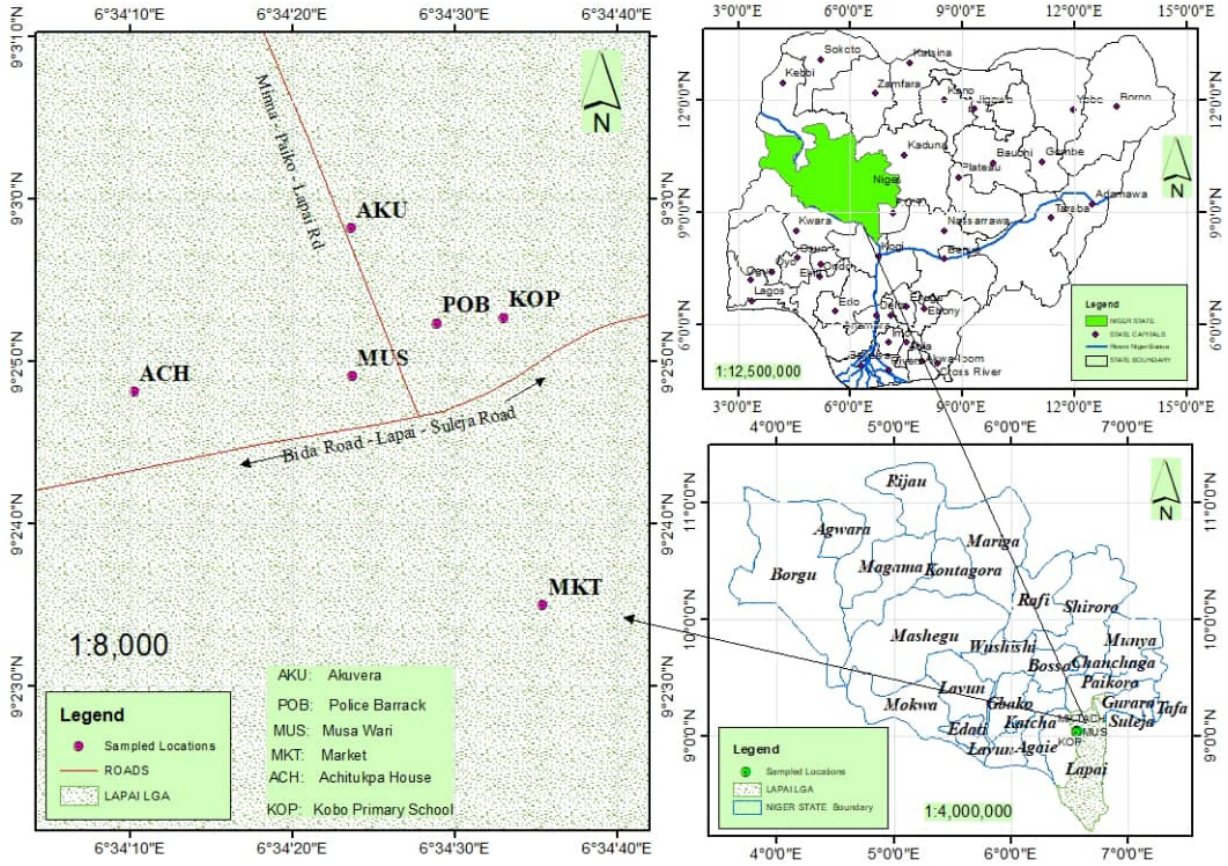

Figure 1: Lapai Map showing the study Area. Source: Field photograph, 2020

Trinocular light microscope). Physico-chemical parameters of soil samples from dumpsites were measured by established method of Badmus *et al.* (2014).

Morphological Identification of parasites collected

The parasites collected were identified using morphological keys of Cheesbrough (2006). Identification of the cysts, oocysts and ova of encountered parasites was done with the aid of parasitological atlases (Chiodini *et al.,* 2003; Cheesbrough, 2006). Physical counts of encountered parasites stages were done on microscope slides and recorded appropriately.

Statistical analysis of data

Data obtained are presented in percentiles, summarized into respective means and accompanied with standard errors. Analysis of Variance (ANOVA) one-way and Post-Hock test was used to determine the significance between means of the various dumpsites selected for evaluation. The means difference between parasite prevalence with respect to season was established using paired sample T-test. All analysis was assumed significance at $p<0.05$. Analysis was done using Microsoft excel and statistical packages for social sciences.

RESULTS AND DISCUSSION

Species diversity of geoparasites at the dumpsites in Lapai Town

The result of the species diversity of parasites found on the dumpsites in Lapai town in Niger State, Nigeria from the period of January to September 2020 is presented in (Table 1). Out of 432samples examined, 222(51.39%) were positive for at least one species of parasites. A total of nine (9) parasites viz; *Taenia solium, Ascaris lumbricoide, Ancylostoma duodenale*, *Strongiloides starcolaris, Entamoeba histolytica, Enterobius vermicularis*, *Schistosoma japonicum, Trichuris trichura* and *Gardia lambla* were found in the soil samples at the dumpsites for the study period. The most frequently observed parasites at the dumpsites were *Ascaris lumbricoide* (41.44%) followed by *Taenia solium*

Table 1: Species diversity of parasites at dumpsites in Lapai Town.

Month	No. Examined	No. Positive	*Taenia solium*	*Ascaris l umbricoides*	*Strongiloides Starcolaris*	*Entamoeba histolytica*	*Gardia lambla*	*Enterobius vermicularis*	*Ancylostoma duodenale*	Trichuris trichura	Schistosoma japonicum
Jan	48	47(97.92)	26(55.32)	15(31.91)	1(2.13)	2(4.26)	1(2.13)		1(2.13)		1(2.13)
Feb	48	35(72.92)	13(37.14)	15(42.86)		1(2.86)		1(2.86)	1(2.86)		2(5.71)
Mar	48	28(58.33)	6(21.43)	14(50.00)		4(14.29)			1(3.57)		1(3.57)
April	48	11(22.92)	1(9.09)	9(81.82)	1(9.09)				1(9.09)		
May	48	26(54.17)	5(19.23)	10(38.36)	7(26.92)	3(11.54)			2(7.69)		
June	48	44(91.67)	4(9.09)	14(31.82)	11(25.00)	3(6.82)		2(4.55)	6(13.64)	3(6.82)	
July	48	11(22.92)	3(27.27)	2(18.18)	1(9.09)				1(9.09)		2(18.18)
Aug	48	15(31.25)	2(13.33)	9(60.00)		3(30.00)		1(6.67)	2(13.33)		
Sept	48	5(10.42)	1(20.00)	1(20.00)	1(20.00)	1(20.00)	1(20.00)				
Total	432	222(51.39)	61(27.48)	92(41.44)	22(9.91)	17(7.66)	2(0.90)	4(1.80)	15(6.76)	3(1.35)	6(2.70)

X^2_{Cal} = 133.933 df = 64 X^2_{tab} = 79.80, P < 0.05

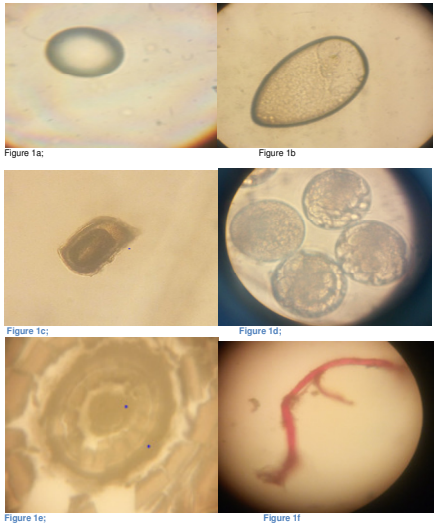

Figure 2: Pictorial representation of some species of parasites seen from selected refuse dumpsites at Lapai town.
Figure 1a; *Taenia*ova as seen under the microscope (X400)Source**:** Field photograph, 2020. **Figure 1b**; *Fasiola hepatical* ova as seen under the microscope (X400) Source : Field photograph, 2020. **Figure 1c**; Hookworm ova as seen under microscope (X400) Source: Field photograph 2020. **Figure 1d;** *Entamoeba coli* as seen under the microscope (X400) Source: Field photograph 2020. **Figure 1e**;Ascaris ova as seen under the microscope (X400)Source: Field photograph 2020. **Figure 1f**; Strongyloids starcolaris as seen under the microscope (X400)Source: Field photograph 2020.

(27.48%) and *Strongiloides starcolaris* (9.91%) (Figure 2). The least frequently observed parasites were *Gardia lambla* (0.90%) followed by *Trichuris trichura* (1.35%). *Gardia lambla* was found in January and September, 2020, while *Trichuris trichura* was found in the month of June only. *Taenia solium* and *Ascaris lumbricoide* were however found all through the months of the study. The result of the Chi-square analysis

shows there was significance difference in the species diversity of parasites during the sampling period at $p < 0.05$.

Conclusion

Due to the high species of parasites found on the un – disposed refuse dumpsites from the study areas, there is need for urgent adequate provision of sanitary facilities, through health education in the study area, Policies on the waste disposal management should be strictly enforced by Government and Location of sanitary dumpsites should be far away from the residential areas to minimize the pollution of nearby well waters, streams and rivers should be encouraged as well as waste sorting and treatment before the disposal.

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