PARASITES IDENTIFICATION AND BACTERIAL ISOLATION IN SOLID WASTE DUMP SITES IN K/VOM JOS SOUTH LOCAL GOVERNMENT AREA PLATEAU STATE

Daniel, Lois Nanzing[1*], Ishaku, Ajang Idoh[2], Danjuma, Theophilus[3] And Ibukunoluwa, Mojirayo Rebeccah[4],

[1] Department of Veterinary Science Laboratory Technology, [2] & [3] Department of Environmental Health Technology, Federal College of Animal Health and Production Technology, P. M. B. 05,Vom, Plateau State, Nigeria. * loismanu1966@gmail.com

[4] Department of Biology, Adeyemi College of Education, Ondo, Ondo State, Nigeria

Abstract

The generation and disposal of solid wastes in the world has become a major concern today. The lapses associated with the collection, treatment and disposal of solid wastes, pollution of soil, water and air create breeding ground for biological agents. These include insects, pests, parasites, rodents, bacteria which could cause public health problem. This study investigated common parasites and bacteria in solid wastes dump sites in K-Vom, Jos South Local Government Area Plateau State. Soil samples were collected in three types of solid waste dump sites (open, pit and fenced dump sites). Floatation technique was used to identify the parasites and Arora *et al*, (2010) bacterial identification method was adopted to identify the bacteria isolates. Data was subjected to Chi-Square Statistical analysis. There was prevalence of 6(60.0%) *Strongyloides stercoralis*, 1(10.0%) *Entamoeba histolytica* and 3(30.0%) Hookworm parasites identified in the study area. Bacteria isolated include *Bacillus* spp. 16(37.21%), *Proteus* spp. 4(9.30%), *Staphylococcus* spp. 6(13.95%), *Pseudomonas mirabilis* 9(20.93%), *Klebsiella* spp. 6(13.95%), *and Aeromonas* spp. 2(4.65%). There was no significant difference (p>0.05) in the occurrence of both parasites and bacteria in solid waste dump sites and location. The result of this study conclude that biological agents were identified in the study area and recommended provision of adequate sanitary facilities in the study area for control of spread of infectious parasitic diseases that could pose health hazards to the inhabitants of the area.

Keywords: Parasites Identification, Bacteria Isolation, Solid Waste Dump Sites

Introduction

The generation and disposal of solid wastes in the world in particular has become a major concern today. It has become a common sight in Nigeria to see heaps of festering solid waste disposals in our urban and commercial cities (Modebe *et al.*, 2011). These wastes are aesthetically unpleasant, constituting eyesores, producing unpleasant odour especially when the organic composition are acted upon by putrefying bacteria (Onyido *et al.*, 2009). The lifestyle of most Nigerians today is a reflection of the consumption and solid waste generation they have adopted, shown in their attitudinal problem of indiscriminate solid wastes disposal on all sides of residential apartments, drains, highways, corners of major and minor streets, underdeveloped plots of lands by many households ((Sule, 2004; Akinwale, 2005). These solid waste disposals provide breeding grounds for biological vectors such as mosquitoes and rodents that enhance disease transmission like malaria, diarrhea and fever, which are of public health concern (Sule, *et al.*, 2004).

According to Bernd *et al.*, 2017, parasites and pollutants interaction in the environment,

sensitivity of parasites to pollutants and environmental disturbances make many parasite taxa useful indicators of environmental health and anthropogenic impact. Afon and Okewole, (2007) stated that the lapses associated with the collection, treatment and disposal of solid wastes pollution of soil, water and air creates breeding grounds for biological vectors such as insect pest and rodents which could cause public health problem. Same author reported an estimated 50.90% quantity of solid waste generated daily in Plateau State Nigeria, and that in most part of Nigeria as well as in developing countries of the world, the urban landscapes are littered with garbages, plastics, bottles, disposable cups and even faeces of both humans and animals.

Mehtab *et al*., (2017) reported that bacterial, viral and parasitic diseases like typhoid, cholera, encephalitis, poliomyelitis, hepatitis, skin infection and gastrointestinal parasites are spreading through polluted water. They stated, further, that indiscriminate disposal of untreated domestic and agriculture wastes around human inhabitant and water sources has negative health effect on both man and animal.

Wilson (2014) characterized parasites as predators that eat the prey in units of less than one, to include protozoa such as agent of malaria, sleeping sickness and amebic dysentery; helminthes such as hookworm; insects such as lice and mosquitoes; plants such as mistotles and dodder; fungi such as honey fungus and ringworm. Gietz (2011) presented six (6) major stages in the metamorphosis of parasitism, namely causative parasites, directly transmitted parasites, tropically transmitted parasites, vector transmitted parasites, parasitoids and micro predator; and that parasitism is a type of consumer resource interaction. According to Shakibaie (2009), in natural environment, such as soil or the surface of plants, the major bacteria are bound to surface in biofilms. Same author reported that in Nigeria, bacteria commonly associated with solid wastes disposal sites include: *Staphylococcus aureus*, *Baccilus* spp., *Proteus* spp., *Klebsiella* spp, *Aerogenes* spp., *Aenomone* spp and *Pseudomonas mirabilis* respectively. Although, veterinary and medical important bacteria have been isolated from solid waste disposal sites in some part of Nigeria, there is dearth of information on the bacteria status of solid wastes disposal in Plateau State and environs, especially in Jos South. This study identified parasites and isolated bacteria in solid wastes dump sites, in Kaduna-Vom, Jos South local government Area, Plateau State.

Materials and Methods

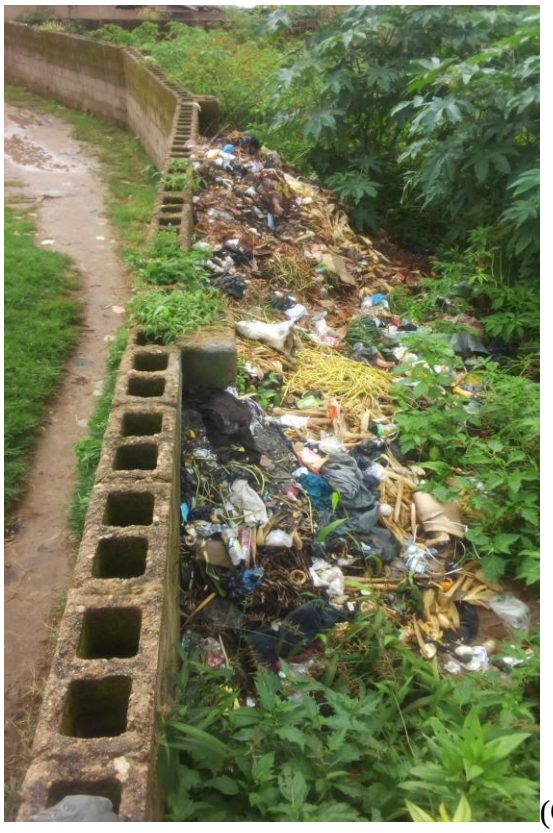
This study was conducted in Kaduna- Vom in Vwang District, Jos South Local Government Area of Plateau State. Samples were collected from randomly selected five different locations of solid waste disposal sites, National Veterinary Research Institute, Angwan Mission, Angwan Madugu, Saint Andrew Primary School and Zankon constituting of pit, opened and fenced dump sites (Plates 1, 2 and 3).

Sample collection

Soil sample collection was carried out by adapting the method described by Cletus *et al.*, (2015). Each of the disposal solid waste dump site was visited four times. Five grams of soil samples in nylon bags was collected from each disposal solid waste dump site. Samples were collected in the morning time. Each sample was divided into two parts, one for parasites identification and one for bacterial isolation. Parasites identification and bacterial isolation were carried out in the Microbiology laboratory of Diagnostic Division of the National Veterinary Research Institute, Vom.

(A)

(B)



(C)

Plate1: (A) Typical Pit Dump Site, (B) Typical Opened Dump Site, (C) Typical Fenced Dump Site

Parasites Identification

Floatation technique using saturated salt solution method of Arora *et al*., (2010) was adopted. One gram of soil sample was mix with 10ml saturated salt solution (sss) in a universal container using an application stick. It was sieved and the suspension was poured back into the container. It was filled to the brim. A clear glass slide was place on top of the universal container and allowed to stand for 10minutes. The slide was viewed under the microscope using x10 objective.

Bacterial Identification

Colonies of bacteria isolates were morphologically identified adopting the methods described by Arora *et al.*, (2010). The soil sample was diluted 1 in 10 dilutions in peptone water. With a wire loop, strikes of mixture cultured on blood Agar and MacConkey Agar were made to give discrete colonies. The colonies were gram positive and gram negative organisms.

RESULTS

Parasites Identification

The results showed that Location A has the highest parasites count 3(33.33%), followed by locations D and E 2 (22.22%), and the least in locations B and C 1(11.11%) (Table1). Results also showed that *Strongyloides stercoralis* has the highest percentage occurrence 6(60.0%), followed by hookworm 3 (30.0%) and the least was *Entamoeba histolytica* 1(10.0%) (Table2).

Table1: Location and Dump Site Occurrence of Parasites

Location			**Dump Site**		
	T1 %	**T2%**	**D1 %**	**D2 %**	**Total**
A	1(33.33)	1(33.33)	0(0.0)	1(33.33)	3(33.33)
B	0(0.0)	0(0.0)	0(0.0)	1(100)	1(11.11)
C	1(100)	0(0.0)	0(0.0)	0(0.0)	1(11.11)
D	1(50.0)	0(0.0)	1(50.0)	0(0.0)	2(22.22)
E	1(50.0)	0(0.0)	0(0.0)	1(50.0)	2(22.22)
Total	4(44.44)	1(11.11)	1(11.11)	3(33.33)	9(100)

P = .681 df =12 $\chi^2 = 9.250$

The occurrence of the parasites from Dump site is independent of the location.

Key:

Location A, is pit dump site; Locations B, C and D are open dump sites and E is fenced dump site

T_1 = top samples one
T_2 = top samples two
D_1 = down samples one
D_2 =down samples two

Table2. Location and Parasites Species Distribution

LOCATION	**SPECIES** (%)			**TOTAL**
	Strongyloides stercoralis	*Entamoeba histolytica*	Hookworm	(%)
A	2(66.67)	1(33.33)	0(0.0)	3(30.0)
B	0(0.0)	0(0.0)	1(100)	1(10.0)
C	1(50.0)	0(0.0)	1(50.0)	2(20.0)
D	1(50.0)	0(0.0)	1(50.0)	2(20.0)
E	2(100)	0(0.0)	0(0.0) 2(20.0)	
Total	6(60.0)	1(10.0)	3(30.0)	10(100)

P = .573 df = 8 χ^2 =7.222

The distribution of the species of parasite does not depend on the location, that means the location does not contribute in any way to the distribution of parasite.
Key: Location A, pit dump site; **Locations B, C** and **D**, open dump sites and **E,** fenced dump site

Bacterial Identification

Results showed that location A has the highest total number of bacteria 11(100%) followed by E 10(100%) and the least is B 4(100%). There was high occurrence of bacteria in down soil one (D1) 12(27.30%) followed by top soil one and down soil two 11(25.0%) and least in top soil two 10(22.70%) (Table3). Table 4 showed that *Bacillus spp* had the highest occurrence 16(37.20%), followed by *Pseudomona mirabilis* 9(20.90%) and *Aeromonas* species occurred least 2(4.70%)

Table 3: Bacterial **Distribution in Relation to Location and Site of Sample Collection**.

Location			**Sites**		
	T1	**T2**	**D1**	**D2**	**Total**
A	3(27.3)	2(18.2)	4(36.4)	2(18.2)	11 (100.0)
B	2(33.3)	2(33.3)	1(16.7)	116.7()	4 (100.0)
C	1(12.5)	2(25.0)	2(25.0)	3(37.5)	8 (100.0)
D	2(22.2)	2(22.2)	3(33.3)	2(22.2)	9 (100.0)
E	3(30.0)	2(20.0)	220.0()	3(30.0)	10 (100.0)
Total	11 (25.00)	10 (22.70)	12 (27.30)	11 (25.00)	44 (100.00)
P=.994	df=12	χ^2 =3.176			

KEY:
A= Pit dump site
B= Open dump site
C= Open dump site
D= Open dump site
E= Fenced site
T1= Top soil sample one
T2=Top soil sample two
D1=Down soil sample one
D2=Down soil sample two

Table 4. Bacterial species Distribution in relation to Location

Location	**Species (%)**						**Total (%)**
	Bacilus spp	*Proteus spp*	*Staphylococcus Spp*	*Pseudomona mirabilis*	*Klebsiella spp*	*Aeromanas spp*	
A	3(30.0)	2(20.0)	1(10.0)	4(40.0)	0(0.0)	0(0.0)	10(23.25)
B	3(50.0)	0(0.0)	1(16.7)	0(0.0)	2(33.3)	0(0.0)	6(13.95)
C	3(37.5)	1(12.0)	1(12.5)	1(12.5)	2(25.0)	0(0.0)	8(18.60)
D	4(44.4)	3(33.3)	0(0.0)s	1(11.1)	0(0.0)	1(11.1)	9(20.93)
E	3(30.0)	0(0.0)	1(10.0)	3(30.0)	2(20.9)	1(10.0)	10(23.25)
Total	**16(37.21)**	**6(13.95)**	**4(9.30)**	**9(20.93)**	**6(13.95)**	**2(4.65)**	**43(100)**
P=.540	df=20	χ^2=18.724					

KEY:
A= Pit dump site

B= Open dump site
C= Open dump site
D= Open dump site
E= Fenced site
T1= Top soil sample one
T2=Top soil sample two
D1=Down soil sample one
D2=Down soil sample two

DISCUSSION

Lack of adequate personal hygiene, poor handling and ineffective management of waste dump have been implicated in the transmission of many infectious diseases including ascariasis, schistosomasis, cholera and typhoid (WHO, 2007). The high occurrence of parasites identified and bacteria isolated in waste dump sites in Jos south local government area, in Plateau State concur with the report of Okoronkwo and Onwuliri, (1997) who had similar studies in Nigeria including Plateau State. Similarly, the commonly found parasites in this study, *Strogyloides stercoralis*, *Entamoeba histolytica* and hookworm conform to the results Okoronkwo and Onwuliri, (1997). This could possibly be due to the constituents of human and animal faeces in the solid waste dump sites where parasites recovered were shed and dispersed indiscriminately. It could also be due to the dumping of abattoir wastes in those areas thereby disseminating parasites of veterinary importance agreeing with the work of Burges (1982) who reported that parasites of veterinary importance are capable of being transmitted to public through abattoir wastes deposited in the waste dump sites. The no significant difference (p >0.05) in the occurrence and distribution of parasites in relation to location and type of solid waste dump sites is an indication that any type of solid waste dump site is a potential avenue for the transmission of parasites of public health importance thereby capable of causing outbreak of water or food borne diseases such as amoebiasis, ascariasis and enterobiasis as reported by Eneaya and Anikwe (2005), WHO (2007) and Iboh *et al*., (2014).

Although, many of the bacteria species isolated in this study were nonpathogenic the number of heterotrophic bacteria (HTB) distributed at sampling sites may indicate deterioration in the microbiological quality of the environment. The findings agree with the report of Colford *et al*., (2002) and Norton and Lachuevallier (2002). The isolation of *Bacillus spp, Proteus spp, Staphylococcus aureus, Pseudomonas mirabilis, Klebisella aerogene spp, and Aeromones spp agrees* with the works of Okoronkwo and Onwuliri (1997) that isolated similar bacteria in addition to *Escherichia coli, Corynebacterium spp and Lactobacillus spp.* Similarly, the no significant difference (p >0.05) in the occurrence and distribution of bacteria in relation to location and type of solid waste dump sites is an indication that any type of solid waste dump site is a potential avenue for the transmission of bacteria of public health importance. Although statistically not significant, numerical values indicate the association between locations and the occurrence and distribution of bacteria isolated. This study concludes that biological agents were identified in the study area and recommended provision of adequate sanitary facilities in the study area for control of spread of infectious parasitic and bacterial diseases that could pose health hazards to the inhabitants of the area.

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