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INDISCRIMINATE SOLID WASTE DUMPING SITES AND ITS PUBLIC HEALTH IMPLICATIONS IN OSOGBO, SOUTHWESTERN NIGERIA

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ABSTRACT
Indiscriminate solid waste disposal poses serious health challenge to humans and animals in developing countries where the practice appears unabated. In order to guarantee clean and safe environment, there is need for assessment of distribution of indiscriminate dumping sites and associated public health risks. The objective of the present study was to determine the distribution and pathogenic organisms associated with the dumping sites in Osogbo metropolis, Southwestern Nigeria. The major streets in the metropolis were surveyed and the coordinates of the solid dumping sites encountered were taken with Geographic Position System (GPS). The bacteriological and parasitological assessments were carried out on soil samples from five selected sites. A total of thirteen major solid waste dumping sites were encountered. Six bacteria, namely Pseudomonas aureginosa, P. Putida, Klebsiella pneumonia, Bacillius species, Aerobacter aeogenes and Proteus vulgaris were isolated from the soil samples. The cysts of Ascaris lumbricoides, Trichuris trichiura and Enterobius vermicularis were also recovered. The results showed that indiscriminate solid waste dumping sites exist in Osogbo metropolis and may be of serious public health problem if it is not curtailed. Therefore, government should embark on public health enlightenment and enforcement of all policies and laws on environmental sanitation to curb indiscriminate waste disposal in the metropolis.
KEY WORDS: *solid waste, dumping sites, bacteria, parasites, health risks, Nigeria*

INTRODUCTION

Domestic and industrial wastes constitute one of the agents of environmental pollution in developing countries. Increase in urbanization due to rural-urban drift has increased significantly the challenges of waste management (Achudume & Olawale, 2007; Ianovici, 2016). There is therefore growing concern in the spate of indiscriminate disposal of wastes in most of urban areas of Nigeria. Many streets are inundated with solid wastes without proper management (Adekanle *et al.,* 2014)

Indiscriminate waste disposal poses serious health challenge to humans and animals. The waste contains infectious organisms and heavy metals that are poisonous to living organisms (Ogundiran & Afolabi, 2008). Pathogenic organisms such as *Pseudomonas, Mirococcus, Actinomyces, Neisseria, Bacillus, Klebsiella* and soil transmitted helminthes have been isolated in some dumping sites (Obire *et al*, 2002). Of major concern is the presence of

heterotrophic pathogens which were, hitherto, thought to be harmless but now constituting serious public health problems (Bartram *et al.,* 2003).

Osun State Government has designated sanitary landfill in the major towns across the state. The wastes are expected to be collected by the designated commercial waste management companies weekly for onward transportation to the sanitary landfill (Achudume & Olawale, 2007). However, due to the poor socio-economic conditions, many households and commercial offices are still unable to meet the obligations of monthly due charge by the waste collectors, hence the indiscriminate disposal of the waste in the environment and unapproved waste dumping sites. These activities, undoubtedly pose serious epidemiological threats to residents of the state as it could promote soil, water and air pollution.

As a capital of Osun State, Osogbo town is not spared of indiscriminate dumping sites despite the concerted efforts by the Government to promote safe environment and improved environmental sanitation. To guide the Government in formulating and implanting effective policies and sanctions on indiscriminate dumping of wastes, there is need for assessment of spacio-temporal distribution of indiscriminate dumping sites and the associated public health risks. To this end, the present study was therefore conducted to enumerate the distribution of indiscriminate waste disposal and pathogenic organisms associated with the dumping sites in Osogbo metropolis, Southwestern Nigeria.

MATERIALS AND METHODS

Study Area

Osogbo is the state capital of Osun State and it is located on the Latitude 70 771N and Longitude 40571E (Adeleke, *et al*., 2012a). The metropolis has two Local Government areas. The majority of the residents are Yoruba by tribe but hosts other ethnic groups within and outside Nigeria.

Enumeration of the solid waste dumping sites in Osogbo

The major streets in Osogbo metropolis were surveyed for the dumping sites. The coordinates of the dumping sites encountered were taken with GPS.

Collection of soil samples from selected solid waste dumping sites

Five major solid waste dumping sites were randomly selected for soil sample collection. The sites are Oja-Oba, Dada Estate, Orisunbare, Oke-Baale and Obanlende. At each site, soil samples were scooped from three (3) locations and transferred into a sterile sample collection bottle for laboratory analysis.

Bacteriological analysis of the samples

Twenty gramme of each soil sample was suspended in a 500ml volume beaker containing sterile distilled water and allowed to steep for 3-5 minutes and the filtrate was discarded. The samples were cultured in MacConkey agar and nutrient broth using standard protocol. The identification of colonies, gram staining, and biochemical tests were conducted following the procedures described by Cowan & Steel (1975), Baron & Finegold (1990) and Chaichanawongsaroj *et al*. (2004) as highlighted in Adeleke *et al.,* (2012).

Parasitological analysis of the samples

The samples were aliquot into round bottom clean plastic containers and allowed to stay on the bench for some hours. The supernatant was discarded using Pasteur pipette. The sediments were transferred into centrifuge and spun for 5 min at 3,000 rpm. The supernatant

was decanted and the deposit was then transfered into a clean glass slide. A drop of iodine was added as stain and covered with a cover slip. The slides were observed under ×400 light microscope for parasite ova and cysts as earlier described by Alli *et al.* (2011).

RESULTS AND DISCUSSIONS

Distribution of the dumping sites

Table 1 presents the coordinates and distribution of major dumping sites encountered during the study in Osogbo metropolis, Southwestern Nigeria. A total of thirteen major solid waste dumping sites were encountered across the major streets in the town. In few occasions, the dumping sites were incinerated by the residents (Figure 1).

TABLE 1: Distribution of dumping sites in Osogbo, Southwestern Nigeria

Latitude	Longitude	Names of locations
7.78	4.55	Old garage
7.75	4.54	Olaiya
7.77	4.54	Fakunle
7.46	4.33	Oke-Baale
7.47	4.35	Oja Oba
7.77	4.55	Igbonna
7.78	4.56	Igbonna
7.78	4.55	Agowande
7.81	4.55	Agunbelewo
7.78	4.54	Okefia
7.79	4.45	Capital Estate
7.79	4.54	Technical Area

FIG.1. A dumping site being incinerated at Oja-Oba, Osogbo

Bacteriological assessment of the solid waste dumping sites

Six bacteria were found in the samples recovered from selected dumping sites in Osogbo metropolis (Table 2). The bacteria include *Pseudomonas aureginosa, P. Putida,*

Klebsiella pneumonia, Bacillius species, Aerobacter aeogenes and Proteus vulgaris. Pseudomonas auriginosa was found virtually in all the locations while *K. Pneumonia* and *Aerobacter aerogenes* were found only in one location.

TABLE 2: Distribution of bacterial isolated at selected waste dump sites in Osogbo

Microorganisms	Dada Estate	Oja-Oba	Obalende	Oke-Baale	Orisunmbare
Pseudomonas aeruginosa	+	-	+	+	+
Pseudomonas putida	+	-	-	+	-
Klebsiella pneumoniae	-	-	+	-	-
Bacillus spp	+	+	+	-	+
Aerobacter aerogenes	-	-	-	-	+
Proteus vulgaris	-	+	-	+	-

NB: += positive; - = negative

Parasitological Assessment

The cysts of three helminthes were encountered in the samples collected. The helminthes are *Ascaris lumbricoides, Trichuris trichiura and Enterobius vermicularis* (Table 3). The cysts of *A. lumbricoides* were found in three out of five locations while *T. trichiura* and *E. vermicularis* were found in one location. None of the cysts was found in Obalende and Orisumbare.

TABLE 3: Parasitological assessment of soil collected from selected solid dumpsites in Osogbo

Parasite cysts	Dada Estate	Oja-Oba	Obalende	Oke-Baale	Orisunmbare
Ascaris lumbricoides	+	-	-	+	-
Trichuris trichiura	-	-	-	+	-
Enterobius vermicularis	-	+	-	-	-

NB: += positive; - = negative

Environmental sanitation is one of the ways of securing healthy living and improved life expectancy (Ianovici, 2016). The results of the present study showed that there exist indiscriminate solid waste dumping sites in the major streets of Osogbo metropolis despite the concerted efforts by the State Government to keep the environment clean and safe. Indiscriminate solid waste dumping sites is one of the major challenges of urbanization in developing countries (Adekanle *et al*., 2014) and Osogbo metropolis is not an exception. Interaction with the residents in some of the areas visited showed that most of them could not afford monthly bill of disposing their wastes through commercial waste Management collectors, thus, resulting in discharge of such waste in an unapproved sites within the town. These wastes are thereafter incinerated by the locales which will aggravate the episode of air pollution in the area. These attitudes, if continued unabated, could lead to more unapproved dumping sites with its attendant risks in the town.

The bacteria isolates and parasite cysts encountered in the present study are of public health importance as they have been reported to cause serious gastro-intestinal disorders (Gray, 1967; Obire *et al.,*2002; Sam-Wobo & Mafiana, 2005, Adeleke *et al.*, 2012b; Sam-Wobo *et al.,* 2012). *Pseudomonas* species, *Bacillius* and, *K. pneumonia* are highly pathogenic and virulent and may cause mortalities in few circumstances (Adekanle *et al*., 2014). Incidentally,

most of these waste dumping sites are more often visited by children and youths in searching for various discarded recreation items.

Even though, previous studies have shown that most of the soil samples in Nigeria are heavily contaminated with pathogens (Olayemi, 1994; Agbabiaka & Oyeyiola, 2012), the presence of cysts of *A. lumbricoides* and *T. trichiura* lends support to the fact that the dumping sites are contaminated with faecal samples. This may further suggest that some of the houses in these areas lack toilets. Feaces are being disposed alongside with solid waste at the sites.

CONCLUSIONS

The results of the present study showed that indiscriminate solid waste dumping sites exist in Osogbo metropolis and may be of serious public health problem if it is not curtailed. Therefore, government should embark on enlightenment of the residents on public health implications of indiscriminate disposal of solid wastes in Osogbo metropolis. The Government is also urged to enforce all policies and laws on environmental sanitation to curb indiscriminate waste disposal.

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