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DETERMINATION OF SELECTED HEAVY METALS IN WATER SAMPLES POLLUTED WITH MUNICIPAL WASTES AROUND IBADAN NORTH LOCAL GOVERNMENT AREA, IBADAN, OYO STATE

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ABSTRACT

In many Nigerian cities, there has been a phenomenal increase in the volume of wastes generated daily within the past few years. This is due largely to the increasing rates of population growth, urbanization, industrialization and general economic activities. In these cities, the habit of dumping and disposing waste indiscriminately has become a common practice among dwellers. Wastes in such places are obviously a source of air and water pollution, land contamination, and environmental degradation. Selected heavy metals' analyses were carried on water samples collected from abandoned well in Agbowo, well from Abattoir, Sabo canal and Mokola stream, all in Ibadan North Local Government Area, Ibadan, Oyo State. The level of Cr in the samples ranges from 0.04 to 0.10mg/l, Pb ranges from 0.01 to 0.04mg/l, Cd ranges from 0.01 to 0.07mg/l, and Fe ranges from 0.33 to 4.02. The results, when compared with WHO's maximum permissible limit show great deviations which call for urgent attention of the government and individual.

KEYWORDS: Urbanization, Waste, Contamination, Heavy Metal.

INTRODUCTION

Waste is an early problem of mankind, and a growing one that is of major concern to every nation of the world [2]. Waste management became a growing problem during the transition from nomadic hunting and gathering to farming. Before the industrial revolution, waste reuse and recycling were the major ways of waste management [3]. However, as populations increased, especially in major cities and urban centers, space for disposing waste became limited and people needed to look for new and better ways for disposing waste. Municipal solid waste (MSW) is a heterogeneous mixture of products with very different physiochemical properties. Its composition varies and depends on the nature of the products, customs of the population, the relative level of quality of life and the type of city.

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Waste composition may also vary according to season, climate, industrial production, size of market for waste materials, extent of urbanization, effectiveness of recycling, and work reduction [1]. High income earners consume more packaged products, glass and textile [6]. Knowledge of MSW composition is essential for the determination of options such as compost production, recycling, and incineration. Such knowledge also allows for environmental protection.

Municipal solid waste management (MSWM) is an important entry point for integrated urban management support. It refers to the collection, transfer, treatment, recycling and disposal of solid waste in urban centers with the aim of reducing environmental nuisance often associated with improper treatment of waste [7,8].

THE STUDY AREA

Ibadan North Local Government Area is one of the five local governments that make up the Ibadan metropolis. The area, which was formally designated for agricultural development now attracts key players in housing delivery, which include the state government, local governments, Property Development Corporation, universities, polytechnic, Federal Government, and private estates in form of site and services. This area covers wards from Beere roundabout through Oke-Are to Mokola in the South-West and Samonda to New Bodija in the South-East and has its headquarters at Agodi. The local government falls between latitude 7023'00" and 70 27'30" North and longitudes 3052'45" and 3056'00" East.

It covers an area of 145.58km, which is approximately 46.6% of the total land area of the city. This makes it the largest in Ibadan. It is also the most populated local government area with an estimate population of 306,795 inhabitants (NPC, 2006).

Ibadan is the capital of Oyo State, is Nigeria's largest city and is the largest city in tropical Africa. As the crow flies, it is 128 km northeast of Lagos and 345 km southwest of Abuja, the federal capital of Nigeria. Since its founding, the city has had rapid growth, both in area and in population. The local government serves as home to large and small industries, households, commercial, educational, religious and medical centers, as well as other various types of institutions.

RESEARCH AREA

BODIJA ABATTOIR

Bodija market is located in Ibadan North Local Government area of Oyo state; it remains the largest foodstuffs market in the South West of the country. It harbors the largest slaughterhouse in the South West area. Because of increase in consumption of meat among Nigerians, butchers face serious challenges of large volumes of waste. Curiously, the main waste disposal practice in the market, nay the abattoir, is dumping. When waste, especially cow dungs, are gathered, they are simply dumped at a spot that has eventually emerged as a mountain.

Figure 1.A Pool of Animal Blood filled with Maggots, Flies, Sachet Water and Bread Nylons

Figure 2.Section of the Abattoir

Figure 3.30 years Old Mountain constituted by Waste from the Abattoir

AGBOWO

Agbowo is a residential area in Ibadan North Local Government where both the students and non-students of University of Ibadan reside. The refuse collection and disposal in Agbowo axis of Ibadan has in recent time become cumbersome and unbearable. As a result, people now brazenly dump their garbage in gutters, drainage, and canals.

Also at the Agbowo Express Road was a dumpsite located beside the transformer which is directly opposite a white one story building known as Hamdala hospital, and a food canteen was situated adjacent to the dumpsite, which is very dangerous to both the patients in the hospital and the residents patronizing the food canteen.

Figure 4.A building situated directly inside the Canal with Pipes from Toilet channeled Outside

SABO

"Sabo" simply means a separate area built for migrants. It is a residential area in Ibadan North Local Government Oyo state where many of the Hausa migrants resided. Refuse collection and disposal in sabo axis of Ibadan has in recent time become cumbersome and unbearable. As a result, people now brazenly dump their garbage in gutters, drainage and canals causing blockage and disturbing the easy flow of water.

Figure 5.A canal filled with Waste

MOKOLA

Mokola is a residential area in Ibadan North Local Government; virtually most of the residential houses in Mokola were built on the hill. Waste management in this area is less alarming compared to the above listed area in Ibadan North Local Government of Oyo state. A stream was sited along Mokola roundabout and Okearemo road, water flowing from this stream has now being turned to commercial motor cycle wash and found on the surface of this waste was oil from the motor bike engine and soap bubbles and particles used in washing the motor cycle. This same water having oily surface is being used by some of the residents for their domestic work. Some women were found taking bath, washing clothes, plates and doing other household chores (Figs. 6,7).

Figure 6.Stream used by Commercial Motorcyclists

Figure 7.Stream used for Domestic Chores by some of the Residents

METHODOLOGY

Four water samples were collected at four different areas in abandoned wells in Agbowo, Abattoir, Sabo canal, and Mokola stream all in Ibadan North Local Government Area between 9.00 am to 2.00 pm in July, 2016.

The samples were collected in plastic bottles and were stored in the refrigerator prior to analysis.

SAMPLE PREPARATION

The samples were digested using aqua regia (mixture of hydrochloric acid and nitric acid in ratio 3 to 1) acid procedure. The digested samples were analyzed for heavy metals using Bulks Scientific 210VGP Atomic Absorption Spectrophotometer.

RESULT AND DISCUSSION

The results of the analysis have been presented in Table 1.

Table 1.Results of Analysis

Location	Cr (ppm)	Pb (ppm)	Cd (ppm)	Fe (ppm)
A	0.04	0.03	0.07	1.50
B	0.05	0.02	0.02	0.33
C	0.06	0.04	0.05	3.44
D	0.10	0.05	0.01	4.02
WHO Standard	0.05	0.01	$5x10^{-6}$	0.3

A. Abandoned well in Agbowo, B. Well from Abattoir, C. Sabo canal, D. Mokola stream

DISCUSSION

The results of the heavy metals considered have been shown in Table 1. Chromium contents in the samples range from 0.04 to 0.10 ppm. When compared with the WHO standard, the values except for sample A were found above the maximum permissible limit of 0.05 ppm. Lead contents of the samples range from 0.02 to 0.05 ppm and were all found above the maximum permissible limit set by the regulatory body. The concentrations of cadmium in the samples were found to be between 0.01 to 0.07 ppm and were considered to be extremely high as compared to 5 x 10^{-6} ppm set by World Health Organization. The iron contents in the samples range from 0.33 to 4.02 ppm and the values were all found above the maximum permissible limit set by WHO. Generally, the variations showed by the level of heavy metals in the samples pose a great threat to health of traders, consumers, residents and passers-by. The silent-killer act calls for urgent attention of the government at all levels and of the individuals.

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