



Impact of solid waste disposal on health and environment in Kano metropolis, Nigeria

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Abstract; Population and Urban growth are solely responsible for high increase rate of solid waste generation in urban areas of world developing cities. Therefore, indiscriminant disposal of solid waste in dumpsite located within urban areas become one of the prominent problem of most developing cities of the world. Open dumpsite without proper management, they can pose major public health threats and environmental effects in urban cities. Nevertheless, in this research, the sources and component of solid waste and type of solid waste disposed in Kano Metropolis haven observed. Moreover, the impact of improper disposal of solid waste on health and environment were treated. The output of the research indicated that excreta and other liquid and solid wastes from households and the community, are seriously hazardous and lead to spread of infectious diseases.

Key words; implication of improper disposal of solid waste on health and environment

I.1 Introduction

One of the major problems facing growing cities in developing world is that of coping with the wastes generated. Waste is every one's business. We all produce unwanted by products and residues in nearly everything we do. The environmental problem of waste disposal is both simpler and complicated. Waste disposal has environmental and health effects. Cities are very much worried with the increasing challenge of solid wastes in particular and this worry is seemingly not being settled, an estimated 20kg of solid waste for instance is been generated per capita per annum in Nigeria. This is equivalent to 2.2 million tons a year [7]. Therefore, as population continues to increase and urban areas continue to expand, and solid waste generated in the country are expected to increase over the years. The cities are centers where industrial productions are concentrated. They are also centers of high consumptions and consequently waste generation. One of the visible problems facing most cities in Nigeria is disposing huge quantities of solid waste are accumulated in urban areas because of urbanization [7].

The U.S. Public Health Service identified 22 human diseases that are linked to improper MSW. Waste workers and pickers in developing countries are seldom protected from direct contact and injury, and the co-disposal of hazardous and medical wastes with MSW poses serious health threats. Exhaust fumes from waste collection vehicles, dust stemming from disposal practices and the open burning of waste also contribute to overall health problems. People know that poor sanitation affects their health, especially in developing and low-income countries, where the people are the most willing to pay for environmental improvements [11].

The household solid waste contains both hazardous and non-hazardous components, which are lumped together and disposed in open spaces or buried. Hazardous waste poses many serious health threats, including chronic and acute toxicity, cancer, birth defects, explosion and corrosion. Leaching from organic matter in open dumps could easily pollute underground water and pose major environmental health threats. It has been associated with the contamination of aquifers underlying landfills [3]. Also waste may eventually get washed away by runoff water to contaminate water bodies or block drainage channels [4]. Open dumps are associated with bad odours and unpleasant odours. Odours result from concentrations of odorous constituents of

decomposing organic matter emitted into the atmosphere and these pollutants were described as environmental nuisance [3].

1.2 Study area



Source Google: Map of Kano Metropolis.

The research design was to study waste disposal at Kano metropolis. Kano is the state capital of Kano State in North West, Nigeria. Created on May 27, 1967 from part of the Northern Region, Kano state borders Katsina State to the north-west, Jigawa State to the northeast, Bauchi State to the southeast and Kaduna State to the south-west. It is situated in the Sahelian geographic region, south of the Sahara. Kano is the commercial nerve centre of Northern Nigeria and is the second largest city in Nigeria. Area: 499 km², Urban area: 251 km², Weather 27°C, Wind W at 11 km/h, 76% Humidity Local time, Climate Aw. The Kano metropolis initially covered 137 square kilometers (53 square miles, and comprised six local government areas (LGAs) Kano Municipal, Fagge, Dala, Gwale, Tarauni and Nasarawa; However, it now covers two additional LGAs — Ungogo and Kumbotso. The total area of Metropolitan Kano is now 499 square kilometers (193 square miles), with a population of 2,828,861 as of the 2006 Nigerian census.

2.1 Methodology

The study examine Kano dumping sites, the research aim to identifying environmental and health impact of solid waste disposal on human settlements around the dumpsites. Data haven collected for the research from primary and secondary sources to present the outcomes on environmental and health impact caused by solid waste disposal at Kano metropolis dumpsites. Firstly, table studied data haven used i.e. secondary data wherein documents and record related

to this research. Appropriate data sources including books, journals, newspaper and activities both published and unpublished haven studied to retrieved background information of environmental and health effect of solid waste disposal at Kano metropolis dumpsites. Secondly, we visited the dumpsite where several household havens interviewed at random. Household residing in the surroundings of the dumpsite also haven investigated. The questions we designed were been tailored to derive information on environmental and health impacts caused by solid waste disposal at Kano metropolis dumpsite and ways to alleviate the problem. Information obtained was used to update the data collected during the table study; Last, but not the least, we administered structured questionnaires (both close and open-ended designed questions) 2,800 households which enabled us to obtain solid information. The first part of the questionnaire obtained data on socioeconomic characteristics such as educational level, marital status, and nature of occupation while the second part obtained information on type of solid wastes generated and method used disposing solid waste by each household. The implications of the dumpsite to the health and environment of the residents' community haven studied. In this research tables, line and bar graphs, and photographs haven adopted for data analysis.

2.2 Sampling Method

Stratified sampling method was used in this research derive our sample out of the population. Social class stratification haven used in order to derive the sample from the existing population. High, medium and low social classes residents were being studied both traditional city and Modern Township of Kano. The population of Kano Metropolis according to 2006 census was 2,828,861. Out of this population 2,810 is been observed as sample, only adult male (household heads) were selected, this is by no means discounting the role of women on solid waste disposal. Men household haven selected because of their culture and religious ascribed decision power on matters affecting household health and sanitation. 562 questionnaires haven distributed to household from high social class strata with low population density and high-income earners household of Nassarawa G.R.A, Bampai, and Railway quarters of Magwam and Badawa layout. 843 questionnaires were been distributed to household from medium social class strata areas of Hotoro, Salari, sharada, Rijiyar Zaki and Tudunyola with medium income earning. and 1,405 questionnaires were been distributed to household from low social class strata which was

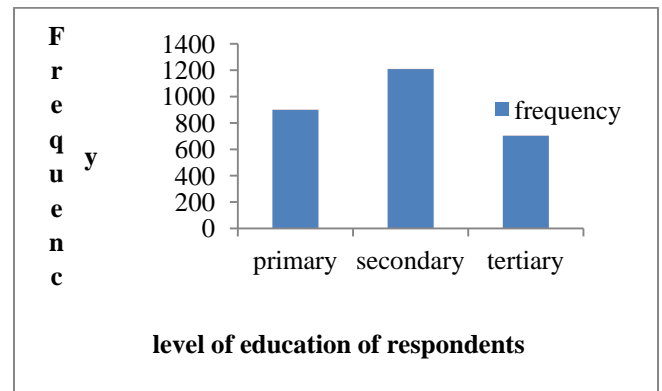
characterized with high population density and low income earners household such as Kabara, part of Rijiyar Lemo, Jakara, Bridgate and Part of Dorayi.

Table 1 educational levels of respondents

Educational Background	Frequency	Percentage %
Primary	899	32%
Secondary	1,208	43%
Tertiary	703	25%
Total	2810	100

Source field work, 2017

Figure .1



3.1 Solid Waste

In simple word-solid waste are any discarded (abandon) or considered waste like materials. Solid waste can be solid, liquid or contaminated gaseous materials, waste tyres, scrap metals, latex paints, furniture and toys, domestic refuse (garbage), discarded appliances and vehicles, uncontaminated used oil and anti-freeze, empty aerosols cans, paint cans and compressed gas cylinders, construction debris and asbestos [3].

Solid waste haven classified into different types depending on their source. Household waste is been generally classified into municipal waste. Waste as hazardous waste, and biomedical waste means any garbage, refuse, or sludge from treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid or contained gaseous material resulting from industrial, commercial, mining and agricultural operation (US Law Solid Waste act 2, 1999).

3.2 CHARACTERISATION OF WASTES

Solid waste are characterize on basis of the following parameters; [13]

1. By their sources

2. By the type of waste produced
3. By generation rate and consumption

3.3. Types of solid waste

- a. Industrial waste
- b. Institutional waste
- c. Construction and demolition waste
- d. Municipal waste

There are four types of solid waste such as;

1. Industrial waste: These are types of waste generated from industries result from processing and manufacturing, these wastes includes chemical waste and packages waste, industrial waste other than mining and minerals production.
2. Demolition waste is waste debris from destruction of building, roads, bridges or other structures [14]. Debris differs in composition, but the main components, by weight, in the US include concrete, wood products, asphalt shingles, brick and clay tile, steel, and drywall [15]. There is the potential to recycle many elements of demolition waste [14].
3. Institutional waste is waste produced from institutions such as schools, hospitals, or prisons. These include waste not typically found in households but also hazardous wastes in some circumstances
4. Municipal of waste disposal

The term “ disposal” means the discharge, deposit, injection, dumping, spilling, leaking or placing of any solid waste hazardous waste into or on any land or water so that such solid wastes, hazardous wastes, or any constituent thereof may enter the environment or be emitted from activities into the air or discharged into any waters, including ground waters.

3.4 Features of solid waste

1. Corrosive waste; these are waste that include acid or bases that has the ability of corroding metal containers e.g. tank [5]

2. Ignitable waste; these are wastes that can create fire under certain situation. Example oil waste and solvent
3. Reactive waste; these waste are unstable in nature, they cause explosions, e.g. toxic fumes when heated
4. Toxic waste; these are wastes which are harmful when ingested or absorb.

3.5 Treatment of waste disposal

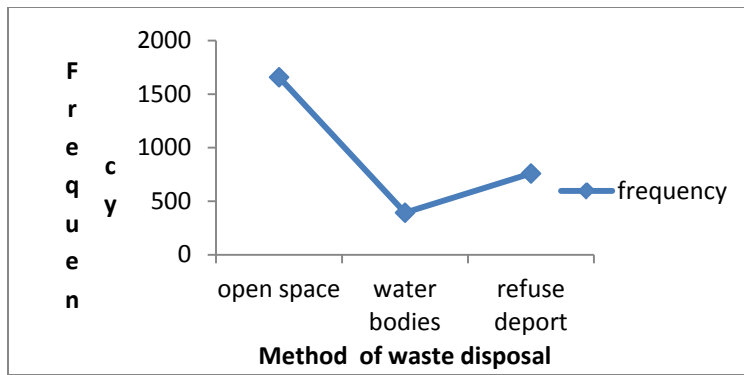
There are wide ranges of method involved in waste disposal. Disposal activities usually involve both the processing and release of solid waste into the environment. The disposal of solid waste principally should involve the use of modified technological methods. Current treatment strategies are focusing towards reducing the amount of solid waste that needs to be landfills, as well as recycling and utilizing the materials present in the discarded wastes as a resource to the largest possible extent. Different methods are used for treatment of solid waste, and the best solution is application of proper method which depends upon refuse composition, land area available and disposal cost they are as follows [5].

- a. Incineration method
- b. Landfills method
- c. Exporting waste to expose village
- d. Open dumps
- e. Water bodies dumping

Table 1.2 Method of solid waste disposal

Method of waste disposal	Frequency	Percentage %
Open space method	1,658	59%
Water bodies method	393	14%
Refuse deports method	759	27%
Total	2,810	100

Figure 2



- a. Incineration method: This is control combustion process of solid waste primarily to carbon dioxide and other gasses and relatively non-combustible residual. Incineration is often alternative named “ Energy from” or “waste-to-energy”; this is misleading as there are other ways of recovering energy from waste that do not involve directly burning it. Incineration is carried out both on small scale by individuals and on a large scale by industries. Incineration recognized as a practical method of disposing of hazardous waste materials, such as biological and medical waste. Many entities now refer to disposal of wastes by exposure to high temperature as thermal treatment [17].
- b. Landfills method: This method has been in existence since early time. It is still one of the most economical waste disposal methods, unlike incineration. Moreover, is an engineered method of disposing solid waste by spreading and through compacting, it into smaller volumes and attempting to reduce associated environmental hazard to the minimum [17].
- c. Exporting waste to expose village: this is a method of waste disposal where wastes are export to villages and exposes these wastes, although, all industrial nations have agreed to stop shipping hazardous and toxic wastes to underdeveloped countries. the practice still continues in 1999, for example, 3,00 tons of incinerator waste from plastic factory in Taiwan was unloaded from a ship in the middle of the night and dumped in field near the small coastal Cambodian village of Bet [10].
- d. Open dumps: often, the way people dispose waste is to simply drop, it in an open dumps. In some places, unregulated open dumps are still the predominant method of solid waste disposal in most developing nations [10].
- e. Water bodies dumping: the oceans are vast, but not so large that we can continue to treat them as carelessly as has been our habit. Every year some metric tons of products packages e.g. half bottles, cans and plastic containers are dump at sea [10].

3.6 IMPACT OF SOLID WASTE ON ENVIRONMENT

Dumpsite may be source of air borne chemical contamination via offsite migration of gasses, particles and chemical adhering to dust, especially during the period of active operation of the site [16]. Contamination of soil and ground water may lead to direct pollution. In case volatile organic chemical into basement of hereby residents and in case consumption of home grown vegetable as well, the potential for surface water contamination increase in rainy season because of flooding in low lying areas in proximity of open dumps (United Nations Environmental Programmes, 1996).

The decomposition of solid waste into constituent chemicals is a common source of local environmental pollution. This problem is especially acute in underdeveloped nations. Very few existing landfills are in the world's poorest countries that would meet environmental standards accepted in industrialized nations, and with inadequate budget, there is likely to be few sites rigorously evaluated prior to use in the future. The main problem compounded by the issues associated with rapid urbanization [11]. A major environmental concern is gas release by decomposing garbage. Methane is a by-product of the anaerobic respiration of bacteria, and these bacteria thrive in landfills with high amounts of moisture. Methane concentrations can reach up to 50% of the composition of landfill gas at maximum anaerobic decomposition (Cointreau-Levine, 1997). A second problem with these gasses is their contribution to the enhanced greenhouse gas effect and climate change [11]

Solid waste may eventually get washed away by rainfall water to contaminate water bodies or block drainage channels (Kjellen, 2001). Open dumps are associated with bad odours and unpleasant odours.

3.7 EFFECT OF SOLID WASTE ON HUMAN HEALTH AND OTHER LIVING ORGANISMS

There are potential risks to environment and health from improper handling of solid wastes. Direct health risks concern mainly the workers in this field, who need to be protected, as far as possible, from contact with wastes. There are also specific risks in handling wastes from hospitals and clinics. For the public, the main risks to health are indirect and arise from the

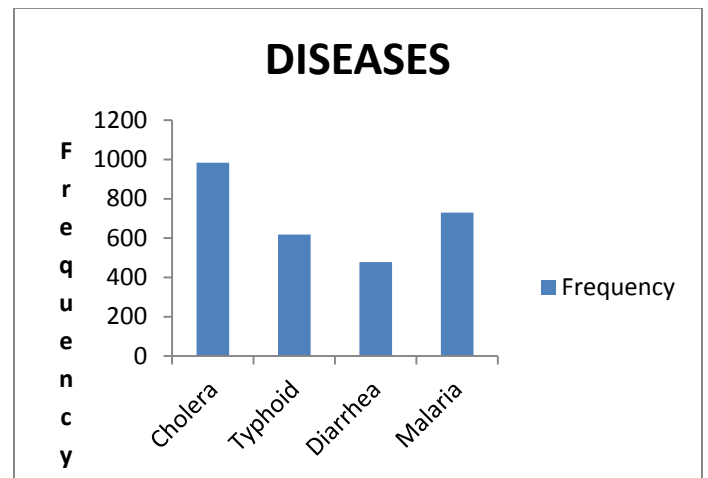
breeding of disease vectors, primarily flies and rats [9]. Uncontrolled hazardous wastes from industries mixing up with municipal wastes create potential risks to human health. Traffic accidents can result from toxic spilled wastes. There is specific danger related to concentration of heavy metals in the food chain. A problem that illustrates the relationship between municipal solid wastes and liquid industrial effluents containing heavy metals discharged to a drainage/sewerage system and /or open dumping sites of municipal solid wastes and the wastes discharged thereby maintains a vicious cycle including these some other types of problem are as follows [11].

Consequently, dumping site have an economic and social cost on public health service and have not yet estimated by government, industries and families. The group at risk from unscientific disposal of solid waste include the population in areas where there is no proper waste disposal method especially the pre-school children; waste workers; and workers of facilities producing toxic and infectious materials. Other groups that are facing high risk include the population living close to waste sites and water supply has become contaminated either due to waste dumping or leakage from landfill of injury and infection (US law solid waste Act 2, 1999).

Table 1.3 Opinion of respondents on Diseases cause by solid waste disposal

Diseases	Frequency	Percentage %
Cholera	984	35%
Typhoid	618	22%
Diarrhea	478	17%
Malaria	730	26%
Total	2,810	100

Figure 3



3.8. CAUSES OF INCREASE IN SOLID WASTE

1. Population growth
2. Increase in industrials manufacturing
3. Urbanization
4. Modernization

Modernization, technological advancement and increase in global population created rising in demand for food and other essentials. This has led to the increase of amount of waste being generated daily by each household [8, 9].

. 3.9 Preventive solution for minimization of adverse impact of solid waste

Proper care need to be taken by government and communities, on how waste could be handled in cities in order to ensure waste does not affect environment and cause health hazard to those people living in areas. At household level, separation of waste should be adopted and ensure that manure is kept aside for composting, which is the best method of handling household solid waste. Consequently, generation of organic matter attract insect and cause outbreak of diseases.

- Generation of waste should minimize.
- Improve method of production to those that minimize waste generation after use.
- Items recycling and recovery should be encouraged.
- Kano state government should increase the level of its public services regarding solid waste treatments
- Enlightens of producer, the public and people that work at waste sector should be increase
- Government should encourage the use of less hazardous alternatives to hazardous chemical during production
- Collection of hazardous waste at source points shall be safe, secure and performed in an environmentally sound manner
- The Government should initiate policies that will force industries to treat their sewage before discharging it, to the environment.
- Community based organization should be encouraged by the government to help in evacuating waste in drainages

Conclusion

The study examined the problems of solid waste disposal and environmental and health implication associated with improper disposal of solid waste. Access to safe disposal facilities is limited for the majority of households of Kano metropolis, and this circumstance resulted in

indiscriminate disposal practices, improper burning, and burying of solid waste. Deteriorating environmental quality is a major cause of high infectious and parasitic diseases. These problems obstruct way of sustainable development possibilities in developing cities. An efficient solid waste management system remains as appropriate tool for achieving sound environmental health in Kano metropolis. Improving access to safe disposal facilities, in addition to conducting awareness campaigns on health impacts of poor sanitation, will help alleviate the problems of improper waste disposal and eventually improve the quality of the environment in the city. Recycling mountains of waste into useful resource will create jobs for recyclers, while also improving the environment by reducing indiscriminate disposal, the amount of waste being disposal of in open space, and the depletion of resource. Metals such as aluminum can be recovered and sold to small-scale recyclers to produce valuable items such as lamps and cooking utensils to compete with imported products, organic waste can be composted and used as manure in urban farming and help reduce reliance on inorganic fertilizers. Waste recycling is usually undertaken by informal recyclers can be mobilized into cooperative organizations to pull resources together for investment, which can be provided with training, protective clothing, and equipment to reduce accidents, infections, deaths and environmental problems (such as pollution, flooding and erosion.).

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