



PUBLIC HEALTH IMPLICATIONS OF POOR MUNICIPAL WASTE MANAGEMENT IN NIGERIA

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Summary

Management of municipal solid waste in Nigeria has suffered neglect from the government, environmental agencies and the general public. This negligence leads to several health issues such as direct injuries from contaminated sharp objects, water contamination by excreta and heavy metal components of municipal solid waste as well as floods resulting from drain obstructions. All these culminate in the possibilities for the transmission of food and water borne zoonoses, vector-borne diseases and the emergence and re-emergence of new zoonoses. To ensure environmental protection and public health, more efforts are required by the government, environmental agencies and the general public. These efforts should be geared towards public enlightenment, enactment and enforcement of policies and legislations on sanitation, improvement of funding, monitoring and supervision, recycling waste and development of landfills to improve the standard of solid waste management in Nigeria.

Keywords: *Public health implications, municipal waste management, zoonoses, Nigeria*

Introduction

Municipal solid waste commonly known as garbage or refuse is a waste type consisting of everyday items that are discarded by the public with variation from country to country. Municipal solid waste changes significantly with time and may include durable goods, non-durable goods, containers and packaging, food wastes and yard trimmings, and miscellaneous inorganic wastes. They are classified based on their composition as biodegradable (food and kitchen waste, green waste), recyclable (glass, bottles, plastics, metals), electrical (electrical appliances, televisions, computers), hazardous (paints, chemicals, light bulbs), and toxic (pesticides, herbicides) wastes. Four hierarchy ranking strategies have been developed by the United States of America for municipal solid waste management based on environmental friendliness from the most to the least preferred methods. These include; source reduction and reuse, recycling or composting,

energy recovery as well as treatment and disposal (38).

The management of this waste is gradually becoming a major challenge in developing countries like ours as a result of industrialization, urbanization and the increasing human and animal populations. The increasing demand for food and other life essentials arising from the increasing global population results in increased amount of waste which are not adequately managed in Nigeria resulting in the contamination of air, water and soil. These environmental contaminations pose serious public health threats.

In developed countries, waste management is tightly regulated and so the generation, collection, processing, transportation and disposal of waste are closely monitored thus reducing its risk to the public (32). For instance, in the United Kingdom over 470 million tonnes of waste were generated between 1998 and 1999 with the mean production of daily household and



commercial waste in European Union Member States being 370Kg/capita/annum between 1993 and 1996. In the United States of America, 254.1 million tonnes of municipal solid waste were generated in 2007. Of this, 63.3 million tonnes were diverted to recycling, 21.7 million tonnes were diverted to composting, and 31.9 million tonnes were combusted with energy recovery. The remaining 137.2 million tonnes were sent to landfills (38).

In Nigeria and most other developing countries, municipal solid waste cannot be considered without including human and animal excreta and sharp hospital equipment from patent medicine stores and drug addicts. This may be probably due to indiscipline among other citizens, lack of toilet facilities in several homes as well as unprofessionalism in the handling and management of municipal solid waste (MSW). Waste management in developing countries is loose for reasons related to negligence from environmental stakeholders resulting in poor funding of the sanitary agencies and lack of organization (6). Though there is no consolidated data on municipal solid waste management in Nigeria, scanty reports have been documented by individual workers in some urban cities. According to Ogbonna *et al.* (24), 20.4kg of solid non-hazardous waste were generated in Port Harcourt by hospitals daily. It was also estimated that between 2007 and 2012, an average of 3.55 million metric tonnes of waste was generated per annum; 3.07 million tonnes of the generated waste were collected while the remaining 478,378 metric tonnes were left uncollected in Lagos (28). Records of MSW generated in other Nigerian cities in 2009 were 1.88, 1.63, 1.37, 1.01, 0.29, 0.18 and 0.14 million metric tonnes for Kano, Ibadan, Kaduna, Onitsha, Makurdi, Abuja and Nsukka respectively (26). Despite this limited data on MSW generation in few Nigerian cities, there is paucity of documented record on waste collection and treatment.

The challenges of municipal solid waste management in developing countries may include low collection coverage, inconsistency

in the collection process, indecency in dumping, uncontrolled environmental pollution, indiscriminate waste picking, scavenging by domesticated animals and breeding of flies and other disease vectors (4). It has been shown that over 33-66% of municipal solid waste generated in the cities of developing countries are not collected (43). These remnants which are usually mixed with human and animal excreta becomes dumped along streets and drainages leading to flooding, breeding of insects vectors and rodents and subsequent disease spread.

The implications of poor municipal solid waste management on public health are contamination of air, water and land. This environmental contamination may result in the emergence of air, water and food-borne zoonoses. Injuries from sharp hospital equipment usually dump at these sites also expose children, adult scavengers and waste workers to diseases such as tetanus, human immune-deficiency virus as well as hepatitis B and C. This review aimed at identifying possible public health implications of poor municipal solid waste management in Nigeria and suggesting possible ways of overcoming these challenges.

Direct effects of poor waste management on public health

Sharp objects such as syringes, scalpels and razor blades disposed at waste dumping sites can cause serious injuries to children visiting these sites either to defecate or play as it is very common in Nigeria. Municipal waste management workers and waste scavengers are also at risk of injuries caused by these sharp objects. These objects can also pose serious health risks to these groups of people if contaminated with infectious pathogens. For instance in the year 2000 alone the World Health Organization estimated that contaminated syringes caused 21 million hepatitis B virus, 2 million hepatitis C virus and 260,000 human immune-deficiency virus infections worldwide (9, 29). These risks are particularly higher in developing countries where scavenging at waste disposal sites and



manual sorting of hazardous waste from health-care establishments is common. Another direct effect may include environmental pollution associated with the decaying of the long standing waste.

Indirect effects of poor municipal solid waste management on public health

Contamination of underground water

Water is vital to life and the existence and quality of life of the people living in a region depends on access to good clean water. Ground water is a crucial link in the hydrologic cycle because it is the source of most of the water in rivers, lakes and wells which are usually municipal sources of water. Contamination of ground water often results from poor municipal waste management. A study by Karija *et al.* (17) showed that drinking water contaminated by municipal solid waste contained faecal coliform counts ranging between 15.25 MPN/100ml of water against the recommended 0 MPN/100ml of water (40, 41). This may be a confirmation that human and animal excreta are components of municipal solid waste in developing countries as was earlier reported (45).

Heavy metals including lead, cadmium, mercury and arsenic from municipal solid waste are also washed into surface and ground water posing serious public health threats. Common sources of these heavy metals in waste may include paint containers and other lead coated containers for lead, cadmium batteries and cigarette stumps for cadmium, broken mercury thermometers and barometers for mercury and containers of arsenic pesticides and wood preservatives for arsenics. These substances are not recycled in Nigeria and are frequently dumped together with household waste ending in the contamination of drinking water sources for humans and animals. Generally, the health effects of heavy metals can be life threatening and may range from headache, irritability, memory deterioration, diminished intellectual capacity, kidney damage (39, 21, 44), liver

disease (14, 22) and bioaccumulation that leads to cancer (10, 35).

Transmission of food and water borne endemic zoonoses

One of the public health implications of dumping waste within human settlements is the risk of transmission of food and water borne endemic zoonoses. These endemic zoonotic pathogens which are usually associated with human and animal excreta on waste dumping sites are usually washed by rains into surface or ground water, contaminating these sources of water for humans and animals, resulting in illness. In addition, food animals serving as vertebrate intermediate hosts can feed on human excreta, acquiring infections which are later transmitted to humans causing serious health problems. Common sanitary food and water borne endemic zoonoses documented in Nigeria include taeniasis/cysticercosis (5, 18, 30), hydatidosis/echinococcosis (2, 34), campylobacteriosis (20, 23, 33, 37), colibacillosis (8, 31) and salmonellosis (16, 19, 27).

Possible emergence, re-emergence and maintenance of diseases

The disposal of dead animals of unknown causes on waste sites especially those within human settlements may pose serious public health threats considering the fact that 61% of infectious disease of humans are of animal origin (15). These dead animals can pose health risk to children, adult scavengers and waste workers visiting these sites. There are possibilities of dead animals disposed at waste sites initiating outbreaks of anthrax in humans and other animals if death is due to this disease especially with the fact that anthrax spores can remain viable in the environment for more than a decade (36). Human outbreaks arising from human contact with animals that died as a result of anthrax have been documented (7, 11, 13). According to the Independent Monitoring Board of the Global Polio Eradication Initiative report of April, 2014, Nigeria was still considered



among the four countries still endemic for poliomyelitis virus; however, the country recorded its last case of poliomyelitis in July 2014 (12). Considering the fact that this disease is associated with poor sanitation (3), maintaining this polio free status requires in addition to strategic vaccination adequate sanitation. Other diseases associated with poor sanitation are cholera, geohelminth infections, typhoid, cysticercosis among others. Adequate MSW management will reduce the incidence of these diseases in Nigeria.

Breeding sites for disease vectors and rodents

Poor municipal solid waste management can lead to the breeding of insect vectors and rodents that are capable of transmitting various diseases. The public health risk becomes higher if these sites are located within human settlements. For instance, municipal solid waste sites either holds water or block drainages resulting in water stagnancy and breeding of mosquitoes which are capable of transmitting malaria. It is estimated that approximately one million people in Africa die from malaria alone each year and most of these are children under five years (42). Other diseases transmitted by mosquitoes are the dengue virus and yellow fever. Rodents from municipal solid waste sites can also enter neighboring houses posing residents of such houses to potential risks of diseases like Lassa hemorrhagic fever. House flies from waste sites can find their ways into neighboring houses and in the process transmit several diseases including cholera mechanically from excreta of infected persons when they come into contact with human food.

Possible intervention strategies

Enactment and enforcement of policies and legislations will serve as useful strategies in improving solid waste management in Nigeria as poor solid waste management was associated with weakness of policy enforcement and implementation (1). The legislative arms of Government at the local, state and federal levels are encouraged to

take up their responsibilities by enacting new laws and policies that will govern the management of municipal solid waste in Nigeria to ensure the protection of the general public from the hazards associated with this menace. With legislations in place, the general public will have the understanding of what is required of them by the law and will abide by them. This can be achieved through the formulation of sanitary committees at the local, state and national legislatures who would sponsor and support all sanitation bills. There is also need for enforcing the existing legislations such as the harmful waste act of 1988, the national environmental standards and regulations enforcement agency act of 2007, the environmental impact assessment act of 1992 as well as the national environmental sanitation and waste control regulations of 2007 among others. Nigerian laws should also enforce areas such as monitoring and supervision of agencies regulating environmental sanitation and solid waste management, waste recycling and landfill development outside human settlement. The absence of these landfills leads to indiscriminate disposal of waste in Nigeria as seen in Figures 1 and 2.

Public education on the principles and effect of waste minimization and recycling is also a critical part of the waste management process. The Nigerian public should be enlightened on the risk of allowing children to scavenge and defecate on refuse dumping sites and the disposal of dead animals on these sites. Waste scavengers and waste management workers should also be encouraged to use protective wears when working to protect themselves against direct injuries from used sharp objects. The public should also be educated on the consequences of indiscriminate defecation and waste disposal within human settlements. Indiscriminate defecation can also be controlled through the provision of toilet facilities at strategic areas for the Nigerian populace especially those living without toilets. All this can be achieved through the

use of schools, environmental extension workers and the media.

Another major challenge associated with poor waste management in Nigeria is the poor funding of agencies coordinating sanitation. For instance, the average fund allocations for sewerage, drainage and refuse services by all the states in Nigeria dropped from 163 million USD between 1981 and 1985 to 17.4 million USD between 1990 and 1992 while local government allocations during the same period dropped from 45 million USD to 5 million USD (26). The resultant effect of this drastic

drop in fund allocations will be of course poor waste management. And so, ensuring a healthy environment in Nigeria requires proper funding of Environmental agencies to be able to carry out this responsibility effectively. Funding may be done by government at the local, state and national levels as well as non-governmental



Figure 1: Refuse dumping site within human settlement in Zaria, Nigeria with a boy dumping refuse and scavenging animals.

Conclusions and recommendations

Health hazards associated with poor municipal solid waste management are real and pose serious public health threads ranging from the transmission of endemic zoonoses to the emergence and re-emergence of new zoonoses arising either from direct or indirect effects of poor waste management. These health hazards can be reduced to minimal levels through public education, enactment and re-enforcement of

organizations. Private sector involvement in environmental sanitation and municipal solid waste management was encouraged (25). This can be achieved through the complete utilization of fund allocations for sanitation and MSW management without diversion by government representatives. With this, there will be willingness to donate towards this noble purpose knowing that their donations will be used judiciously. Other ways to encourage their involvement may be through reasonable taxation and favorable economic policies that will enable businesses to strive positively.

Attitudinal change in the area of self-control towards misappropriating public funds allocated for sanitation and waste management will also go a long way in helping in the management of municipal solid waste, thus creating a health environment that will impact positively on public health.



Figure 2: Refuse dumping site within a primary school in Zaria, Nigeria with a human waste scavenger

policies and legislations, improvement of funding, monitoring and supervision, recycling waste and development of landfills among others. It is pertinent that all human settlements regardless of their sizes and locations to develop landfill for proper waste management which will preserve the environment and promote the well being of the Nigerian public



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