

**ASSESSING THE IMPACTS OF IMPROPER MEDICAL WASTE DISPOSAL AND RESIDENTS PERCEPTION OF THEIR DISPOSAL PRACTICES IN HADEJIA METROPOLIS, JIGAWA STATE, NIGERIA**

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**ABSTRACT**

Medical waste disposal (MWD) in developing countries is a major environmental and public health concern especially in many urban areas with high numbers of health centers. This study assessed the impact of improper MWD and its effects on public health in Hadejia Metropolis, Jigawa state, Nigeria. Primary and secondary data were used. The samples for this study comprised of residents near Health centers and people that worked either within or outside the Medical centers. About 150 respondents were sampled using systematic random sampling technique. The research results showed that medical waste generated by hospitals/clinics were hazardous in nature. About 80 percent of the respondents indicated that burning was the major method of waste disposal applied by Health centers and this medical waste were burned without any notice to neighbouring communities. About 96.7 percent of the respondents opined that burning of hospital waste contaminated the environment and affected their well-being and health. This study recommended that protection of communities against health risks from burning method of medical waste should be made mandatory by government for health institutions.

**Keywords:** Assessment, burning, disposal, environmental and public health, Hadejia metropolis, medical waste.

**INTRODUCTION**

Improper management of medical waste is a major cause of serious environmental problems in terms of water, land and air pollution especially in developing countries [1, 2]. Proper management of medical waste is a criterion to the protection and wellbeing of urban and rural residents [3, 4] within the vicinity of health institutions. Pollutants can be categorized biologically, chemically and radioactively in nature. Environmental problems can arise from

generation of medical waste and from the processes of its handling, treatment and disposal [2]. Improper hospital waste management practice in most areas of developing countries can jeopardize the health, and safety status of health care staff, patients and those living in the vicinity of the health institutions. Inappropriate disposal of such hospital waste (HW) leads to environmental pollution or contamination [3]. There are potential risks to the environment and public health from improper handling of hospital wastes which include hazardous substances, infectious materials, pathological materials, etc. There are specific risk in handling wastes from hospitals and clinics. For the general public, the main risks to health are indirect, and arise from the breeding of disease vectors, primary flies and rats. Clinical and non-clinical wastes constitute the larger part of hospital waste, which are usually categorized into liquid waste (wastewater) and solid waste. Both can lead to environmental degradation and are major sources of health hazard.

No standard and universally accepted definitions for ‘hospital waste’, ‘medical waste’, ‘regulated medical waste’, and ‘infectious waste’ exist in literature. Many definitions are in use by practitioners and regulators. Given the diversity of interest and scientific credentials of persons, groups, and agencies (e.g. physicians, health departments, hospitals, environmentalists, trade unions, and state legislators) involved in the medical waste issue, these differences should be expected [4]. However, adoption of a definition by a regulatory agency has serious ramifications. ‘Hospital waste’ (or solid waste) refers to all waste, biological or non-biological, that is discarded and not intended for further use. ‘Medical waste’ refers to materials generated as a result of patient diagnosis, treatment, or the immunization of human beings or animals. ‘Infectious waste’ refers to the portion of medical waste that could transmit an infectious disease [2].

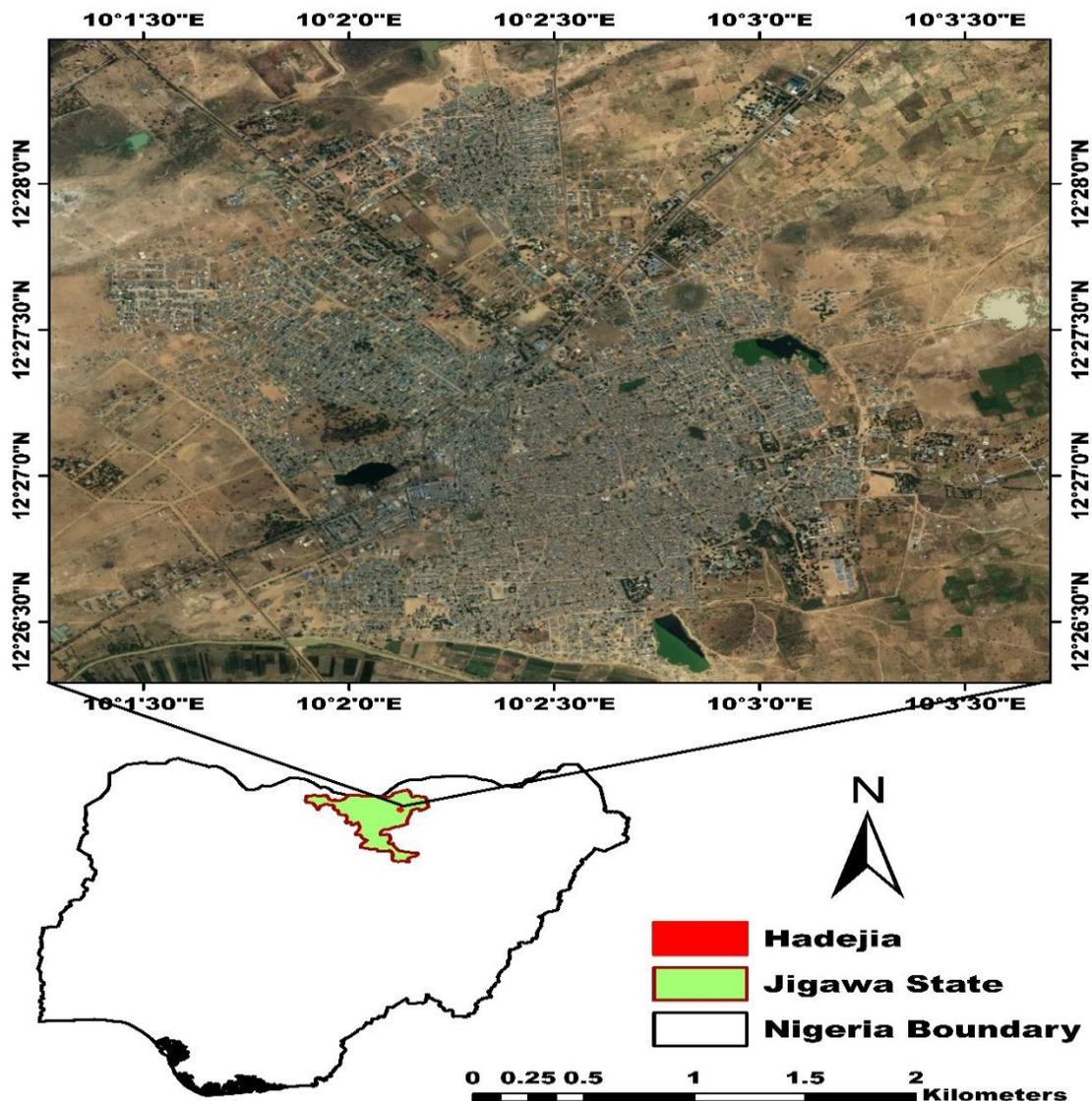
In Nigeria, hospital waste management is crucial due to the large production of hospital waste [5, 7]. Studies on impacts of hospital waste management are needed for public health and safety. Knowledge of the impacts from hospital waste management, risks and benefits of the different available hospital waste management options are necessary. More than 90% of the waste generated in Nigerian hospitals are directly disposed improperly on land [5]. In Nigeria, hospital waste were largely mismanaged in the past, mainly because the sector did not know what to do

with the waste. Mishandling of waste generated from hospital implies improper treatment of waste during collection, storage, generation, transport and treatment [3]. This paper analyses the impacts and residents' perception of improper hospital waste management disposal, and its effects on public health and safety in Hadejia metropolis, Jigawa state, Nigeria.

## **MATERIALS AND METHOD**

### **Study Area**

The study was carried out between June and July, 2016 in Hadejia Local Government Area. Hadejia is a [Hausa town](#) in eastern [Jigawa State](#), Northern [Nigeria](#). It is geographically located between Latitude and Longitude of 12.4506° N, 10.0404° E. The population was approximately 105,628 in 2006. With estimated 2.94%/year increment, the projected population is 139, 400 in 2016. The town lies to the north of the [Hadejia River](#), and is upstream from the [Hadejia-Nguru wetlands](#), an internationally important ecological and sensitive zone [2]. The average maximum and minimum temperature and precipitation recorded as 2016 was 34.6<sup>0</sup>c and 21.5<sup>0</sup>c with 177.7mm in 2016 and 35.5<sup>0</sup>c and 21.1<sup>0</sup>c with 274.1mm in 2017 [6].



**Figure 1:** Study Area Map.

### Methodology

Primary and secondary data were used. These data sources included information from journals, newspapers, books, internet sources and questionnaire survey. The number of samples for questionnaire survey was 150 respondents. In the study area there were 11 political wards but 10 wards were selected for the questionnaire administration and in each ward 15 respondents were selected. Table 1 indicates the Health Centers available in the study area and their Globas positioning system coordinates.

**Table 1:** Health Centers in the Study Area and their coordinates

S/N	Health Centers Names	Coordinates (N/E)
1	Hadejia General Hospital	12 <sup>0</sup> 26' 44.91"/10 <sup>0</sup> 02' 43.73"
2	Gabari Primary Health Care	12 <sup>0</sup> 27' 41.93"/10 <sup>0</sup> 02' 55.14"
3	Gawuna Primary Health Care	12 <sup>0</sup> 27' 25.61"/10 <sup>0</sup> 01' 47.69"
4	Fanisau Primary Health Care	12 <sup>0</sup> 26' 54.74"/10 <sup>0</sup> 03' 15.5"
5	Agumau Primary Health Care	12 <sup>0</sup> 26' 34.02"/10 <sup>0</sup> 02' 12.35"
6	Kofar Arewa Maternity health enter	12 <sup>0</sup> 27' 20.38"/10 <sup>0</sup> 02' 31.71"
7	Arewa clinic (private)	12 <sup>0</sup> 27' 56.53"/10 <sup>0</sup> 02' 02.62"
8	Barga clinic (private)	12 <sup>0</sup> 27' 34.16"/10 <sup>0</sup> 02' 37.76"



Figure 2: A dumping site in one of studied Health Center

The data obtained were analyzed using simple statistical method (percentages).

## RESULTS AND DISCUSSIONS

### Demographic analysis

Table 2: Demography of the respondents

Data type	Response type	Frequency	Percentage
Gender	Male	75	50
	Female	75	50
	Total	150	100
Educational level	Primary	9	6
	Secondary	52	34.7
	Tertiary	75	50
	Others	14	9.3
	Total	150	100

Occupation	Civil servant	54	36
	Business	20	13.3
	Agriculture	17	11.3
	Students	21	14
	House wives	7	4.7
	Unemployed	31	20.7
	Total	150	100

Statistical method based on the data obtained from the population samples was used to assess the impact of improper hospital waste management on public health and safety in Hadejia Metropolis. The demographic results show that 150 respondents were used in this study. About 50 percent of the respondents were male, and 50 percent of the respondents were female. Most of the Health centers were in the vicinity of residential areas.

The educational status of the respondents indicates that 50 percent had tertiary level of education, 34.7 percent had secondary level of education, while 6 percent had primary certificate. In terms of occupation, 36 percent of the respondents were civil servants, 11.3 percent of the respondents work in agriculture; 14 percent of the respondents were students, while housewives constituted 4.7 percent of the respondents and 20.7 percent of the respondents were unemployed.

TABLE 3: Location of hospital dumping sites for medical waste

Dumping site	Frequency	Percentage
Within the hospital	107	71.3%
Outside the hospital	24	16%
Others	19	12.7%
Total	150	100%

TABLE 4: Period that hospital medical waste been burned

Period	Frequency	Percentage
Morning	35	24%
Afternoon	15	10%
Evening	78	52%
Night	21	14%
Total	150	100%

TABLE 5: Time taken for burning the hospital medical waste

Time	Frequency	Percentage
1-2 hr	40	26.7%
1-3 hr	60	40%
1-4 hr	42	28%
4- above	8	5.3%
Total	150	100%

TABLE 6: Method of medical waste disposal inhospital /clinics in Hadejia Metropolis

Burning method	Frequency	Percentage
Burning	85	56.7%
Burial	35	23.3%
Selling	10	6.7%
Dumping	30	20%
Total	150	100%

The findings from this research showed that medical waste generated in the studied Health Centers (public and private) included syringes, diagnostic samples, chemicals, unused clothes, containers, saline bags, needles, plastics, bottles, cotton wools, gloves, urine, blood, polythene, etc. The hospital and clinics dumping sites for medical waste are given in Table 3. It showed that 71.3 percent of the wastes were burned within the hospital/clinic. While only 16 percent of the medical waste were burned outside. The preferred method of hospital waste disposal adopted among the Health centers [7] in the study area included burning (76.7 percent), burial (23.3 percent), selling (6.7 percent) and open space dumping (20 percent). The results of the findings also indicate that the percent of hospital/clinics medical waste burned in a day and period of burning were : 52 percent of the waste were burned in the evening, 24 percent in the morning, 14 percent in the night, while 10 percent in the afternoon. Burning of hospital waste in the study area, normally took a long period of time as 40 percent of the respondents stated that it lasted between 1 to 3 h, 5.3 percent stated that it took more than 4 h.

The findings of this study showed that about 80 percent of the respondents indicated that the hospitals burned their medical waste without any notice to the public. About 96.7 percent of the respondents thought that burning of medical waste by the Health centers contaminated the environment and this affected the public's health and safety [8]. However, there was no health hazard to the public that was specifically attributed to improper hospital waste management [9]. This study revealed that the practice of proper hospital waste disposal and management in the studied hospitals were inadequate. There was lack of implementation of policies and regulations especially as specified by WHO [12] on hospital waste disposal.

### **Effects of improper disposal of medical waste**

Medical wastes are a source of contamination and pollution to both humans and the natural environment. Improper medical waste disposal may be hazardous and leads to contamination of water supplies or local water sources used by nearby communities or wildlife. Sometimes, exposed waste may become accessible to scavengers and children if a landfill is insecure. Medical wastes are potentially capable of causing diseases and illness in man, either through direct contact or indirectly by contamination of soil, groundwater, surface water and air [13]. Medical waste incinerators can release a wide variety of pollutants, depending on the

composition of the waste. These pollutants include particulate matter such as fly ash; heavy metals such as As, Cr, Cu, Hg, and Pb; acid gases such as hydrogen chloride, hydrogen fluoride, sulfur dioxides and nitrogen oxides; carbon monoxide; and organic compounds. Pathogens can also be found in the solid residues and in the exhaust of poorly designed and badly operated incinerators[14]. Improper hospital waste constitutes a threat to the public because it comprises of harmful chemicals which readily affects and enters the environment through different routes of exposure [4]. Because of inadequate information on medical waste management technologies in developing countries[13] burning method is applied intensively and it negatively affects health and safety of local communities in general [14].

Public health effects of hospital waste is contingent on the duration of burning waste and the amount of toxic materials that enters the human body living within the environs from the hospital waste dump. Humans are exposed to dangerous substances contained in hospital waste which include pathogens and chemicals (inhalation), swallowed material (ingestion), and skin openings or dermal absorption [15]. Due to the structure of the human lung, the body's retention capacity for airborne particulates that carry toxic chemicals and pathogens are highly dependent on particle size. Dermal absorption can be enhanced by scratched, broken, roughened or abraded surfaces of the skin on the ankles, hands, neck or facial areas. The face or hands are the most affected skin areas. Water-soluble toxic chemicals can be absorbed throughout the body since the human metabolism operates on a water-based chemistry.

The chemical poisons in hospital waste can affect different parts of the body: for instance, hepatotoxic agents (e.g. carbon tetrachloride, tetrachloroethane) affect the liver; nephrotoxic agents (e.g. halogenated hydrocarbons) affect the kidneys; hematopoietic toxins (benzene, phenols) affect blood; and neurotoxic agents (e.g. methanol, metals, organometallics) and anaesthetic agents (e.g. ethyl ether, esters, acetylene hydrocarbons) affect nerve systems and consciousness, respectively.

## CONCLUSION

The findings of this study in general revealed that people living around the health centers in the study area have negative perception about the burning method of hospital wastes and the waste disposal practices. They feel that these practices may lead to severe effects on their health,

environment and safety. Because of inadequate information on medical waste management technologies in developing countries, burning method is applied intensively and it negatively affects health and safety of local community in general. Practice of proper hospital waste disposal and management are inadequate. This study revealed that hospitals at the study area do not implement policies and regulations especially as specified by WHO on management of hospital waste.

## **RECOMMENDATIONS**

The following recommendations are made:

- ❖ Proper medical waste management strategy is needed to ensure health and environmental safety of neighboring community.
- ❖ Protection of neighboring community against health risks arising from burning hospital waste methods can be considered for effective infectious waste control measures.
- ❖ Proper management ensures that infectious waste is handled in accordance with established and acceptable procedures from the time of generation through treatment of the waste and its ultimate disposal.
- ❖ Use of alternative technologies, particularly autoclaving. Autoclaving is an environment-friendly high-pressure sterilization method that eliminates bacteria, viruses, fungi, and spores.
- ❖ There is an urgent need for awareness to people neighboring hospital and clinic on effects of pollution by burning waste

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## REFERENCES

1. Olukanni, D.O, Azuh, D.E., Toogun, T.O & Okorie, U.E. (2014). Medical waste management practices among selected health-care facilities in Nigeria: A case study, *Scientific Research and Essays*, 9 (10), 431–439.
2. Manyele, S.V. (2004). Effects of improper hospital-waste management on occupational health and safety, *African Newsletter on Occupational Health and Safety*, 14, 30–33.
3. Awodele, O., Adewoye, A.A. & Oparah, A.(2016). Assessment of medical waste management in seven hospitals in Lagos , Nigeria, *BMC Public Health*, 16 (1), 269.
4. Mato, R. R. A. M. & Kassenga, G.R. (1997). A study on problems of management of medical solid wastes in Dar es Salaam and their remedial measures, *Resources, Conservation, and Recycling*, 21, 1–16.
5. Lekwot, V. E., Nunyi, B. V., Ifeanyi, E. & Adamu, B. (2012), Public health implication of improper hospital waste disposal in Zonkwa district of Zangon-kataf local government area , Kaduna state, *Journal of Research in Environmental Science and Toxicology*, 1(1), 23–28. 2012.
6. Bupoly, Binyaminu Usman Polytechnic, Hadejia Meteorological Station, Hadejia, 2017.
7. Birhanu, Y. & Berisa, G. (2015). Assessment of Solid Waste Management Practices and the Role of Public Participation in Jigjiga Town , Somali Regional State , Ethiopia, *International Journal of Environmental Protection and Policy*, 3 (5), 153–168.
8. Kuchibanda, K. & Mayo, A.Y. (2015), Public Health Risks from Mismanagement of Healthcare Wastes in Shinyanga Municipality Health Facilities , Tanzania, *The Scientific World Journal*, 2015, 1-11.
9. Adekunle, I. M., Oguns, O., Shekwolo, P.D., Igbuku, A.O.O. & Ogunkoya,O.O. (2012). Assessment of Population Perception Impact on Value-Added Solid Waste Disposal in Developing Countries , a Case Study of Port Harcourt City , Nigeria, *In Tech.*, 178-206 [www.intechopen.com](http://www.intechopen.com).
10. Mumtaz Hussain, M. M. M. (2014). Awareness about Hospital Wastes and its effects on the Health of Patients in District Dera Ghazi Khan Mumtaz, *Asian J. Appl. Sci. Eng.*, 3 ( 8), 111–115.
11. Kumar, E.S. (2010). *Waste Management*, Editor : Er Sunil Kumar. InTech publisher,

Croatia.

12. Beldia, F. Health and Ecological Effects of Burning Medical Waste (2015). <https://www.epa.gov/nutrient-policy-data/health-and-ecological-effects>. Accessed: 27-Dec-2017.
13. Alam, M.Z., Islam, M.S. & Islam, M.R. (2013). Medical Waste Management : A Case Study on Rajshahi City Corporation in Bangladesh. *J. Environ. Sci. Nat. Resour.*, 6(1), 173–178.
14. O. Access (2015). Practices and challenges of infectious waste management : A qualitative descriptive study from tertiary care hospitals in Pakistan, *Pak J Med Sci*, 31 (4), 795–798.
15. Oyedele, O.A. & Oyedele, A.O. (2017). Impacts of Waste Dumps on the Health of Neighbours : A Case Study of Olusosun Waste Dump , Ojota , Lagos State, Nigeria, *Journal of Civil, Construction and Environmental Engineering*, 2 (1), 27–33.