

*Full Length Research Paper*

# The Impact of Improper Hospital Waste Disposal on Public Health in Zonkwa District, Kaduna State's Zangon-Kataf Local Government Area

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This study examines public health effects of improper hospital waste disposal. Primary data was collected from households residing in the area. 124 copies of well structured questionnaires were administered to the households. Questions were related to socio-economic characteristics of households and health effects of improper hospital waste management. Data collected were analyzed using descriptive methods. The study result reveals that the disposal of untreated hospital wastes poses an environmental threat and public health risk. Indiscriminate disposal of untreated hospital waste is often the cause for the spread of several infectious diseases. It is also responsible for hospital acquired diseases to the health care personnel who handle these wastes at the point of generation. Apart from the above, a good amount of hospital wastes such as disposable syringes, infusion bags, I.V. fluid bottles etc. are picked up by rag pickers and are recycled back into the market without any disinfection. It is important, therefore, to implement proper environmentally safe mode of disposing hospital wastes.

**Keywords:** Public health, Hospital waste, Infectious diseases, Waste disposal.

## INTRODUCTION

There are potential risks to environment and health from improper handling of hospital wastes. There are specific risks 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, primarily flies and rats.

One estimate shows that some 5.2 million people (including 4 million children) die each year from waste-related diseases. Globally, the amount of hospital waste

generated will double by the year 2000 and quadruple by year 2025" (Haque, 1994 in Akter et. al. 1999).

A large part of hospital waste usually consists of clinical and non-clinical waste, these wastes can, therefore, be broadly classified into solid wastes, and liquid waste (wastewater). Both are important source of physical and natural environmental degradation and constitute a health hazard. The soil associated or under the disposed wastes is one of the main reservoirs of microbial life, and contaminated water contains pathogenic microorganisms, which are causative agents of different types of disease. Proper management of hospital waste is critical to the health and well-being of urban and rural residents (World Bank 2003). Inadequate management of hospital waste in most areas of developing countries leads to problems that impair human and animal

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Table 1. Neighbourhoods and households sampled in the study area

S/No	Neighbourhood	Number of Households	Number of Households Sampled
1	Ungwar Musa	73	4
2	Ungwar Ruguni	239	12
3	Ungwar Abaya	146	7
4	D-One	277	14
5	Zonkwa Central	362	18
6	Ungwar Mal. Silas	69	3
7	Ungwar Dauke	21	1
8	Ungwar Rama	191	10
9	Ungwar Chiyawa	186	9
10	Ungwar Mission	268	13
11	Ungwar Danbaki	121	6
12	Ramai Gida	81	4
13	Ungwar Narom	36	2
14	Ungwar Sanzwam	88	4
15	Ramai Daji	97	5
16	Ungwar Ayah	160	8
17	Ungwar Masat	75	4
<b>Total</b>		<b>2490</b>	<b>124</b>

Source: Field survey 2011

health and ultimately result in economic, environmental and biological losses (Sharholy *et al.*, 2008).

The inter-relationship between public health effects, perceived or real, and the range of hospital waste management processes regulated is an important cause of concern to the public at large today. There have been an increasing number of epidemiological research reports linking a range of ill-health outcomes to hospital waste management installations. These studies include childhood cancers, birth abnormalities and liver cancers associated with incinerators and with landfill facilities.

The production of hospital waste in Nigeria in the foreseeable future is inevitable, so hospital waste management is a necessity. Given this fact, there is a need for an overview of the current state of knowledge regarding the public health impacts from hospital waste management, and a comparative assessment of the risks and benefits of the variety of available hospital waste management options

The improper management of hospital waste causes serious environmental problems in terms of air, water and land pollution. The nature of pollutants can be classified as biological, chemical and radioactive. Environment problems can arise from the mere generation of medical waste and from the process of handling, treatment and disposal. This paper analyses the effects of improper medical waste management and recommends proper means for safeguarding health care workers.

In Nigeria, hospital waste was largely mismanaged in the past, mainly because the sector did not know what to do with the waste. The procedures for safe waste

handling were not adhered to; for example, there were deficiencies in designation and identification of infectious waste, segregation, packaging and storage, as well as in transport procedures.

More than 90% of the hospital waste generated in Nigeria is directly disposed on land in an unsatisfactory manner (Vivan *et al.*, 2011)

## AIM AND OBJECTIVES

The thrust of this paper is to examine the public health effects of improper hospital waste management in Zonkwa district of Zangon-Kataf Local Government Area of Kaduna State, Nigeria.

### Objectives

- To examine the waste management practices in hospitals and the waste handling and disposal practices by hospitals in the study area.
- To assess the effects of hospital waste on the health of hospital workers and the general public.
- To assess the level of awareness of health workers and the general public on the effects of improper hospital waste management.

### Study area

Zonkwa District, the study area is one of the districts of

Zangon-Kataf Local Government Area and is the administrative headquarters of Zangon-kataf Local Government Area of Kaduna State and is one of the Local Government that makes up Southern Kaduna Senatorial District.

## **MATERIALS AND METHODS**

The method of data collection was through the use of applicable sampling techniques. Since the research population is made up of the households in the study area, since the research population is made up of people whose health has been impacted upon by improper hospital waste disposal, these are the residents of the study area, the researchers carried out a stratified sampling to delimit the area of study into neighbourhoods. There are seventeen (17) neighbourhoods in the study area. The area was stratified based on the neighbourhoods in the area. The neighbourhoods were then delimited using the simple random sampling technique to select various households for the research work. From these neighbourhoods, the study samples were taken. Information on the number of households in the various neighbourhoods of the study area was obtained from the National Population Commission (NPC) of Zangon-Kataf Local Government Secretariat.

The breakdown on how the samples were taken from the households in the seventeen neighbourhoods that makes up Zonkwa District is shown in Table 1. The study chose a sampling size of 5% for the households in the study area which is 124 households out of a total of 2490 households in the study area. The sample size of 5% was chosen for convenience due to the limited time available to carry out the research. Oral interviews were also conducted with health workers in all hospitals within the study area and sanitary officers in the Local Government Secretariat. And a checklist was used to find out the waste disposal facilities present in all hospitals within the study area and to find out if hospitals within the study area treat their waste before disposing. Simple statistical methods was used to analyze the data obtained. This will include the use of both descriptive and inferential statistics in the summarization of the data into charts, tables, graphs and percentages to be obtained in the course of the research work.

## **DISCUSSIONS AND RESULTS**

In Zonkwa, all types of waste that are generated are disposed of by open dumping in either low depressions or high areas. Waste decomposition occurs by means of natural degradation. One type of waste that has been completely ignored in Zonkwa is medical waste. These wastes are a source of contamination and pollution to

both humans and the natural environment. There is not much study done on medical waste disposal in Zonkwa. A study was conducted by Vivan et al (2011) on hospital waste management of some selected hospitals in Zonkwa District. The study found that the government hospital placed all wastes in open dustbins (i.e. open waste containers that are accessible to the general public) and the wastes were left in the open for one to two days. The private hospitals left their wastes outside in open dustbins for two to three days at a time before they are disposed in open dumps. The study concluded that there is a lack of knowledge and interest in safe waste disposal by most health workers and an absence of adequate waste disposal facilities to effectively implement safe waste disposal. The study made recommendations for the proper disposal of such wastes.

The overall findings of this study indicate that there is a lack of awareness, concern, and knowledge of appropriate handling and disposal methods of medical waste. This was apparent not just at the government hospital but also at, private laboratories, and private clinics. Clearly, well conceived waste disposal systems are severely lacking in both government hospitals and private clinics.

The findings from the questionnaire administered to the one hundred and twenty four (124) respondents in the study area are as follows: A variety of methods were used by the hospitals to dispose of waste. These included burning, burial, selling, dumping, reuse and removal by municipal bins. Table 2 below is the summary of waste disposal practices at Government hospital and clinics, private clinics and laboratories. There was no clear guidance to segregate wastes and ensure their proper disposal. Most hospitals collected all wastes together and dump in a common place. Those places were roadside, hospital surroundings, land fills and open dumps. Waste is placed in dustbin, resold or poured down drain to the main sewer.

It was discovered in the study that there were several mode of waste transport. Waste was primarily carried by open bucket as respondent mentioned (44.38%) and plastic bowl (23.86%). Hospital wastes are disposed in several places: Pit near hospital (dig a hole); Open field / road way / by the road side; stream/ditch; Own closed dustbin. Notably, most wastes were disposed of in open bins (59%) without any treatment or separation. Also, saline bags, x-ray water, syringes, vials, slides, empty packets and bottles were collected and sold. Medical waste was collected by hospital authority, waste picker, cleaners and sold to whole seller, hawkers. Quite a number of the poor in Zonkwa collect materials from waste dumps as source of income. The wastes pickers (scavengers) sort through waste at site, usually open dumps, and sell anything that can be recycled to agents of industry.

The waste pickers have no special protection for sorting through wastes and are in danger of becoming

**Table 2.** Wastes disposed and disposal methods by Government and privates hospitals in the study area.

<b>Sold</b>	<b>Burned</b>	<b>Buried</b>	<b>Dumped</b>	<b>Container</b>	<b>Destroyed by acid</b>
Container	Clothes	Common	D/syringe	Tips	Cotton
Syringe	Gauze	waste	Saline bag set	Reagent	Needle
Saline bag	Cotton	Needle	Gloves	Chemicals	Syringe
D/Syringe	Mattress	Syringe	Needle	Blood	TB slides
Bucket	Bandage	Blood lancets	Cotton	Urine	Sputum pot
Saline set	Paper	Specimen	Gauze	Stool	Tested
Needle	Gloves	collection pot	Bandage	Sputum	sample's vials
X-ray	Saline bag	Blood	Pad	D/syringe	
water	Saline set	Urine	Paper	Needle	
Plastic	X-ray film	Stool	Plastic	Gloves	
bottle	Needle	Sputum	TB slide	Slide	
ampoules vials	Syringe	Saline bag	Sputum	Broken glass	
	Blood bag	Damaged	Polythene		
	Plaster of Paris	body part	Blood sample		
	Apron	Placenta	Tissue paper		
	D/ syringe	Slides	Common		
	Plastic	Cotton	wastes		
	Sputum pot,		Dressing		
	TB slide		Stool		
	Blood		Urine		
	Urine		Broken tube		
	Stool		Acid		
	Bed sheet		bottle		
			Syringe		
			Paper packet		
			Placenta		

**Source:** Field Survey 2012

seriously infected with diseases. Though large scale recycling occurs for both medical and non-medical wastes, waste pickers are in constant danger of becoming contaminated and injured.

Most of the respondents did not know the harmful impact of medical waste; they also did not know the harmful impact of recycling of wastes. Also, they are not aware of the environmental effect of medical wastes. Study also showed that the hospital staffs including high officials and waste collectors were not aware of the safe disposal and handling of hospital waste. Laboratory analysis shows high levels of contamination from infectious wastes at various sources in the environment.

Children, adults, and animals all have the potential to come into contact with these wastes which may pose severe health risks to them. Samples were collected from several sources including dustbins (where hospital wastes are dumped), wastewater from hospital drains, and laboratory basins from different hospitals in Zonkwa District. Laboratory analysis showed that there is a relationship between improper disposal of hospital waste and severe contamination of these infectious wastes to public health and the environment.

There was no safety measure observed in dealing with

waste disposal or laboratory analysis of infectious or hazardous diseases. The chemicals used for the staining and preservation of "slides" and for the sterilization and cleaning of equipment and "surroundings" are potentially harmful to the laboratory technician and the environment as shown in table 3 below. This is due to lack of environmental awareness among the respondents, which is true for maximum people of the country.

The study findings indicate that there is a need to improve medical waste handling and disposal methods. None of these institutions have proper waste disposal systems in place to manage their medical wastes.

### **Effects of improper disposal of hospital waste**

Medical wastes are a source of contamination and pollution to both humans and the natural environment as discussed in this paper. Improper disposal may be hazardous if it leads to contamination of water supplies or local 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 disease and

**Table 3:** Types of chemicals used in hospitals and their uses and effects.

Chemical	Purpose of Use	Properties	Potential Effects
Xylene	removal of seederwood oil for TB slides	Toxic	inhalation of vapours can cause: headaches; euphoria; light-headedness; dizziness, drowsiness; nausea vapour can irritate skin, eyes, and lungs over exposure can lead to irregular heartbeat, fainting, and eventually death
Carbol Fuchsin	fixing of sputum slides	Corrosive poisonous	readily absorbed and can cause severe burning if brought into contact with skin/eyes/lungs inhalation results in chest pains, increased heart rate, coughing, nose and throat irritation, convulsions, and eventually death
Phenol	Disinfectant and sterilizer	Corrosive combustible poisonous	can cause severe burning to skin, eyes or lungs if contact made can seriously affect lungs and respiratory system in inhaled (pulmonary edema, lung inflammation) potentially fatal ingestion causes nausea, vomiting, gastrointestinal irritation and bleeding over exposure can lead to kidney and liver damage
Hydrochloric Acid	fixing of sputum slides	Corrosive poisonous	may cause burning sensation if brought into contact with skin/eyes inhalation causes coughing/restricts breathing and damage to upper respiratory system
Methylene Blue	fixing of blood and sputum slides		can cause damage if brought into contact with eyes, skin, clothing
Chemotherapy and Anti-neoplastic Chemicals	Treatment	Hazardous Toxic	Carcinogenic, other health risk
Formaldehyde	Pathology, autopsy, embalming	Hazardous Toxic	health risk suspected carcinogens eye, nose and throat irritation
Glutaraldehyde (fixer, developer)	Photographic (X-ray)	Hazardous Toxic	health risks
Ethylene Oxide	Sterilizers	Hazardous Toxic	Harmful to health
Acid gases (e.g. HCl, NO <sub>x</sub> , SO <sub>2</sub> )	Laboratory	Hazardous	Acute effects such as eye and respiratory irritation May enhance the toxic effect of heavy metals
Chlorine made material (e.g. PVC)	Laboratory	Hazardous	Creates dioxin Animal carcinogen and considered human Carcinogen
Heavy metals (mercury, arsenic, and zinc, for example)	Instruments, treatment, Medicine industries	Toxic (neurotoxic)	Women and children are most vulnerable Have carcinogenic, mutagenic and teratogenic effects Exposure lead to pneumonitis, branchitis muscle tumor, irritability, gingivitis Nerve damage Enter to the food chain and concentrated In humans, these metal can produce kidney and liver disorders, weaken the bone structure, damage the central nervous system Cause blindness, and lead to death

Source: Adopted from Akter et al

illness in man, either through direct contact or indirectly by contamination of soil, groundwater, surface water and air.

Windblown dusts from these dumps also have the potential to carry pathogens and hazardous materials. Where domestic animals are allowed to graze in open dumps, there is a risk of reintroducing pathogenic micro-organisms into the food chain. Medical wastes therefore pose a risk to individuals, communities, and the environment if not carefully handled (Akter *et. al*, 1998).

Wastes attract scavenging animals and bats. As it ferments it gives off foul odors, favors fly feeding and contaminates both water and air. Piles of refuse or landfill during its decomposition process generate several gases, the most important among which are methane (CH<sub>4</sub>), nitrogen (N<sub>2</sub>) and occasionally hydrogen sulfide (H<sub>2</sub>S). If burnt, carbon di-oxide (CO<sub>2</sub>) is released. CH<sub>4</sub> and CO<sub>2</sub> are greenhouse gases and have potential greenhouse effects. The soil underlying these wastes is typically contaminated by pathogenic micro-organisms, heavy metals, salts, and chlorinated hydrocarbons. These wastes also cause public nuisance by blocking sewers and open drains, encroaching on roadways, diminishing landscape aesthetics and giving off unpleasant odour and dust (World Bank, 1991).

Hospital waste incinerations are one of the largest sources of dioxin and mercury pollution. The ash contains high levels of toxic substances such as heavy metals, dioxins and furans. Ironically, as the air pollution equipment becomes more effective in removing particulate matter, the toxicity of the fly ash increases. In most cases, disposal of incinerator ash in landfills without a sufficient soil or other impermeable cover may contaminate groundwater. Incineration has specific health concern since it not only destroys the pathogen but also the material on which the pathogen resides. Thus, those materials go under a process of transformation and dematerialization. In the process they transform solid and liquid toxic waste into gaseous emissions, particulate matters. The acid gases (e.g. hydrogen chloride, nitrogen oxides and sulphur dioxides), can cause acute effects such as eyes and respiratory irritation, can contribute to acid rain, and may enhance the toxic effects to heavy metals. Particulate matter can cause chronic health effects. Burning of chlorine made material e.g. PVC, creates dioxin, a known animal carcinogen, and considered as human carcinogen.

## CONCLUSION AND RECOMMENDATIONS

Hospital wastes pose severe effects on health and the environment. There is not enough information on medical waste management technologies and impacts in developing countries. Practice of proper medical waste disposal and management is also inadequate. However, from this study it can be said that there is an urgent need for raising awareness and education on hospital waste issues. Proper waste management strategy is needed to ensure health and environmental safety.

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## REFERENCES

- Akter N, Acott RE, Chowdhury SA (1998). Medical Waste Disposal at BRAC Health Centres: An Environmental Study. BRAC Research, Research and Evaluation Division, 75 Mohakhali C/A, Dhaka 1212
- Akter N, Kazi NMA, Chowdhury MR (1999). Environmental Investigation of Medical Waste Management System in Bangladesh with Special Reference to Dhaka City. BRAC, Research and Evaluation Division, 75 Mohakhali, Dhaka 1212, Bangladesh.
- BAN and HCWH (1999). Medical Waste in Developing Countries. *An analysis with a case study of India, and A critique of the Basel -TWG guidelines*. Basel Action Network (BAN) secretariat, Asia Pacific Environmental Exchange, 1827 39th Ave. E., Seattle, WA. 98112 USA.
- Shaner H (1997). Professional Development Series; Becoming a Mercury Free Facility: A Priority to be Achieved by the Year 2000. American Society for Healthcare Environmental Services of the American Hospital Association.
- Sharholi M, Ahmad K, Mahmood G, Trivedi RC (2008). Municipal solid waste management in Indian cities – A review. *Waste Management* 28 (2): 459– 467.
- Vivan EL, Blamah NV, Ezemokwe I, Okafor CI (2011) An Assessment of Hospital Waste Management in Some Selected Hospitals in Zonkwa District of Zangon-Kataf Local Government Area of Kaduna State. *Int. J. Environ. Studies*.
- WHO (1999) (web site). Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies. Essential Drugs and Other Medicines Department, World Health Organization, Avenue Appia 20, CH-1211 Geneva 27, Switzerland
- World Bank (1991). Environmental assessment sourcebook. Volume II: Sectoral Guidelines. World Bank Technical Paper No 140, Environmental Department, The World Bank. Washington, DC.