

OPTIMIZATION OF HEALTH HAZARDS CAUSED BY BIO-MEDICAL WASTES FROM HEALTH CARE UNITS IN REWA, (MADHYA PRADESH)

***Rashmi Arnold**

*Department of Botany, Govt., Model Science College, Rewa, M. P.

Article Received on
05 Oct 2015,

Revised on 27 Oct 2015,
Accepted on 17 Nov 2015,

***Correspondence for
Author**

Rashmi Arnold

Department of Botany,
Govt. Model Science
College, Rewa, M.P.

ABSTRACT

During the last few decades, the need for the better healthcare has been felt globally and to cater the needs and demands of the increasing population, a rapid mushrooming of hospitals, both in private and government sector has occurred. Consequently there has been a proportionate increase in the quantum of waste generated by these health care centers but it is ironic that the healthcare settings, which are meant to restore and maintain community health, are also threatening their well-being by poor waste management practices while posing a huge risk to the health of the public, patients, professionals and contribute to environmental degradation.

KEYWORDS: Bio-medical waste, hazards, solid waste, Municipal Corporation etc.

INTRODUCTION

Solid waste has been a major environmental issue everywhere since the industrial revolution. Besides the waste we generate at home, school, market and other public places, there are also those from hospitals, pharmaceuticals, industries, farms and other sources.^[1] Humans rely so much on material things and they all (almost) end up as waste; this is why Matejicek and Benesova, considered solid waste as something, which the holder discards or intends to discard because they have become useless and unwanted such as: papers, plastic containers, bottles, cans, food and even junked cars, tires, refrigerators, stoves and scraps of broken electronic goods, broken furniture, hospitals waste, and other packaging materials are all examples. Some of these garbage, trash, refuse, and rubbish are biodegradable e.g., food droppings, paper products as well as vegetation like grass and twigs. Others are not biodegradable, and they include plastics, metals, and aluminum cans, broken computers and

car parts. Since they do not easily decay, they pile up in refuse dumps and landfills; a place where the city's rubbish are sent and remain for a number of years. These bring great harm to the land, water and people around it.^[2,3]

Sangodoyin, (1991) notes that except from these wastes, there is second group of hazardous or harmful solid waste which can potentially threaten public health or environment. Such waste could be inflammable (can easily catch fire) or difficult to treat, keep, dispose of. They may contain substances which are reactive (can easily explode), corrosive (can easily eat through metals) or toxic, infectious, carcinogenic (poisonous to human and animals).^[4,5]

According to Marshal (1995), open dumpsites are a major problem to the environment, especially on the air that the people inhale. Dumpsites emit obnoxious odors and smoke that cause illness to people living in, around, or closer to them.^[6] According to Wrensh, (1990) dumpsites maybe a source of airborne chemical contamination via off site migration of gases and the particles and chemicals adhering to dust, especially during the period of active operation of the site. Contamination of soil and groundwater may lead to direct contact or pollution of indoor air for example in the case of volatile organic chemicals into basements of nearby residents and in the case of consumption of home grown vegetables as well. He further stated that in some sites, volatile organic chemicals have been detected in odored air of homes nearby dumpsites.^[7,8]

In a number of community health surveys, a wide range of health problems, including respiratory symptoms, irritation of the skin, nose, and eyes, gastrointestinal problems, psychological disorders, and allergies, have been discovered. A number of researches have been carried out in response to concerns from the public, often triggered by nuisances caused by emissions of volatile organic compounds. For example, according to Dolk (1997), dump sites closer to residential areas are always feeding places for dogs and cats. These pets, together with rodents, carry diseases with them to nearby homesteads.^[9,10,11]

The UNEPA (2006) state that wastes that are not properly managed, especially excreta and other liquids and solid wastes from households and the community, are a serious health hazard and could lead to the spreading of diseases. The report further states that unattended wastes lying around attract flies, rats, and other creatures that, in turn, spread diseases. Normally, it is the wet waste that decomposes and releases a bad odor. The bad odor affects

the people settled next to the dumpsite, which clearly shows that the dumpsites have serious effects to people settled around or next to them.^[12]

Certain wastes merit special handling and disposal because of their dangers or volume. The best option is to minimize or eliminate the generation of these wastes by encouraging users to apply cleaner production approaches and substitute materials or change processes (see “Environmental Guidelines for Activities with Micro-and Small Enterprises” in this volume). Those that are generated should be collected and disposed of separately from one another and away from the rest of the solid waste stream.^[13]

Hazardous and non-hazardous wastes are differentiated in waste management legislation of many countries. A range of legal definitions exist for hazardous waste, but it can generally be thought of as waste or a combination of wastes with the capacity to impair human health or the environment due to its quantity, concentration, or physical, chemical or infectious characteristics when improperly used, treated, stored, transported or disposed. In many countries, hazardous (toxic) industrial wastes (both organic and inorganic), solid incinerator residues, bottom and fly ash are disposed in special hazardous waste landfills, and specialized disposal or incineration may also be practiced for healthcare wastes.^[14,15]

Human and animal wastes are usually not disposed of in landfills, although animal carcasses and waste from abattoirs may in some countries be disposed of in dumps and landfills. Human corpses are not generally regarded as waste, but they degrade in a similar way to other organic waste, and also produce leachate in significant quantities. The majority of corpses are buried in cemeteries, although a significant proportion are cremated (incinerated), the proportion varying from country to country depending on the proportions of different religious groups in the population and their funeral rites.^[16,17]

MATERIALS AND METHODS

In Rewa city, adequate and requisite to number of sanitary landfills is lacking. Thus health institutions are generating Bio-medical waste including hazardous and dangerous waste in the form of solid and liquid.

Segregation

The waste was segregated separately, according to its characteristics, at the point of generation, mainly from the patient care areas. The hospital used color coded high density

polythene bags for identification and segregation of Bio-medical solid waste, non-infectious and domestic type of material was collected in black polythene bags. Both types of infectious and non-infectious wastes were collected once a day. However, the wastes from the operation Theaters and Intensive Care Units were collected more often, depending on the number of operations and cases attended in any particular day.

Packaging

Infectious wastes were packaged to

1. Protect waste handlers and the public from possible injury and disease that could result from exposure to the waste.
2. Avoid attraction to rodents and vermin.

The integrity of packaging was preserved during handling, storage, transportation and treatment. Objects that are capable of puncturing or cutting including syringes with needles, scalpels, blades, pipettes and broken glass were put in puncture proof containers. The needles tips were first defected prior to incineration by soaking them for a period at last 30 min in a freshly prepared 1% hypochlorite solution before discarding them in the bins. This practice was observed in all HCUs in Rewa city.

Storage

The Bio-medical waste under solid waste category was not stored for more than 8 hours off site. The bins in the wards were strictly placed away from patients and from the nursing stations.

Collection, replacement of empty color coded bags and transportation

The collection of infectious and non-infectious wastes were undertaken by two teams of two members each, one for pulling the cart and distributing empty polyethylene bags and the other member for sealing the bags into the carts and replacing the bins with polyethylene bags. The staff was aware of potential hazards of material they were handling and were found to take requisite protective measures. They wore impervious gloves and masks in the designated cart, taking adequate precautions to prevalent and spillage from the plastic bags.

Final disposal

A simple dictum was followed in the final disposal of hospital waste: "Infectious waste was subjected to treatment with either heat or chemicals and non-infectious waste need not to be treated." Bio-medical solid waste comprising (A) human anatomical waste (B) microbial and

Biotechnology waste (C) sharps (D) soiled waste (E) solid waste (F) discarded medicines and drugs were collected in red, yellow and blue color coded high density polyethylene bags and disposed off in an incinerator. The local municipal authorities the segregated non hazards general waste collected in black bags every other day for suitable disposal.

Following recommendations were made for improving the Bio-medical waste management practices of the health care units of Rewa city:

- Segregation should start at the source of generation and by the generation itself.
- Bi o-medical waste should not be mixed with other waste of Municipal Corporation.
- Every hospital should have special boxes to use as dustbin for Bio-medical waste.
- Separate clinical waste storage area should be allocated away from public access.
- Professional health care waste management representative should be employed.
- Training of municipality workers by medical person in handling of medical waste to avoid risks and health hazards.
- Periodical surveillance of health care management practices should be concluded.
- Specific fund should be allocated for the use of incinerator.

RESULTS AND DISCUSSIONS

Rewa city generates approximately 315.78 Kg/day Bio-medical waste and maximum waste is generated through Sanjay Gandhi Medical Hospital, Rewa. Hospital authority thinks that their basic responsibility is to take care of the health of the patients whereas the waste disposal in an environmentally compatible manner has been given in a low priority.

In the present study though majority of black bags were carried away by Municipal Corporation but during storage in Sanjay Gandhi Memorial Hospital as well as other nursing homes it was found that rag pickers use to collect needles, disposal drugs syringes and pvc items from bags which were found in the bags due to poor segregation practices. Similar findings were seen in a study at S. N. Medical College Agra by Chauhan and Sharma, who found many garbage dumps in and around the health care facilities which have been frequently visited by rag pickers. This practice not only encourage disposable being repacked and sold without proper disinfection but they also expose rag pickers themselves to injuries with sharps and other infections. These finding are also in agreement with those of Nema and Ganesha, (2002).^[15]

Health hazards

According to the WHO the global life expectancy is increasing year after year. However death due to infectious disease is also increasing. A study conducted by WHO in 1996, reveals that more than 50,000 people die every day from infectious diseases. One of the major causes for the increase in the infectious is improper waste management. Infectious disease spread through Bio-medical waste are Tuberculosis, Pneumonia, Diarrhea, Tetanus, Whooping cough etc.^[18]

Occupational hazards

Occupational health concerns exist for janitorial and laundry workers, nurses, emergency medical personnel and refuse workers. Injuries from sharps and exposure to harmful chemical waste and radioactive waste also cause health hazards to employees in institutions generating Bio-medical waste. Proper management of waste can solve the problem of occupational hazards to a large extent.

Hazards to the general public

The general public's health care also is adversely affected by Bio-medical waste. Improper practice such as dumping of Bio-medical waste in Municipal dustbins, open spaces water bodies etc. leads to the spread of diseases. Emissions from incinerators and open burning also lead to exposure to harmful gases which can cause concern and respiratory diseases. Plastic waste can choke animals, which scavenge on openly dumped waste. Injurious from sharps are common features affecting animals. Harmful chemicals such as dioxins and furan can serious health hazards to animals and birds. Certain heavy metals affect the reproductive health of the animals.

Regarding the health care of workers three infections are most commonly transmitted hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV). Among the 35 million health care workers worldwide, the estimations show that each year about 3 million receive hard exposure to blood borne pathogens, 2 million of those to HBV, 0.9 million to HCV and 17,000 to HIV.

Measures to reduce hazards

Actual hazards resulting from medical waste can be reduced by:

- Segregating general waste from medical waste;
- Efficiently separating different categories of medical waste at the point of generation;

- Labeling hazardous wastes;
- Disinfecting before disposal (where possible);
- Disposing of different categories of medical waste into appropriate disposal systems; and
- Incinerating to destroy hazards (note that ineffective incineration may not remove all hazards and may cause air pollution).

Measures to cut transmission pathways

Direct contact between people and hazardous waste can be prevented by:

- Providing personal protective clothing and equipment (e.g. heavy duty gloves, safety glasses, overalls, etc);
- Designing systems to minimize contact (e.g. good storage facilities, more effective transportation, lack of double-handling, etc.);
- Restricting access to medical waste pits or landfill sites; and improving education about dangers of medical waste.

Indirect contact between people and hazardous waste can be reduced by:

- Applying vector control methods (e.g. covering waste);
- protecting water sources from contamination;
- Implementing good hygiene practices when dealing with waste (e.g. hand washing); and
- Implementing final disposal by effective sanitary

Table 1- Percentage constitutions of harmful waste

S. No.	Constituents	Approx. %
1	Pathological waste	5
2	Infectious materials	10
3	General non-infectious	50
4	Kitchen waste	30
5	Recyclable materials	4.5

Table-2 Major components of healthcare wastes

S. No.	Waste category	% of total composition (w.t.)
1	Bandage, linen and other infectious waste	30-35%
2	Plastics	7-10%
3	Disposable syringes	0.3-0.5%
4	Glass	3-5%
5	General waste	40-45%

Table -3 Types of infections caused by Bio-medical waste

S. No.	Infection type	Pathogen	Transmission path
1	Gastrointestinal infections	Enterobacteria: Salmonella, Shigella, Vibrio cholera	Faces/vomiting
2	Respiratory infections	Mycobacterium tuberculosis, Measles virus and Streptococcus pneumoniae	Respiratory secretions/saliva
3	Eye infections	Herpes virus	Eye secretions
4	Genital infections	Neisseria gonorrhoeae, Herpes virus	Genital secretions
5	Skin infections	Streptococcus spp.	Purulent secretions
6	Anthrax	Bacillus anthracis	Secretions of skin lesions
7	Meningitis	Neisseria meningitidis	LCR
8	AIDS	HIV	Blood, semen, vaginal secretions
9	Viral hepatitis A	HVA	Faces
10	Viral hepatitis B and C	HVB and HVC	Blood, biological fluid

Table-4 Risks, pathways and hazards of Bio-medical waste

S. No.	Risks	Pathways	Hazards
1	Contraction of disease/Infection	Direct or indirect contact through a carrier	Pathological wastes and infectious wastes may transmit disease and infection through direct contact or via vectors
2	Cuts	Direct contacts	Sharp waste including needles, glass and scalpels may cause cuts which provide entry into the body for infection
3	Ineffective medical care	Direct	Consumption of expired pharmaceuticals possible through inappropriate prescription by unscrupulous medical practitioners
4	Cancer	Direct/ indirect contact or proximity to waste	Radioactive waste
5	Burns and Skin irritation	Direct/ indirect contact or proximity to waste	Toxic chemicals/radioactive waste
6	Injury from explosion	Being within the vicinity when explosion occurs	Pressurized containers
7	Pollution of groundwater, surface water and the air	Direct or indirect contact with polluted water or release to atmosphere	Toxic chemical wastes Pharmaceuticals Waste with heavy metal contact

CONCLUSION

One of the major problems that have besieged almost all communities in the less and developing economies is the improper waste disposal and management strategies. Considering the severity of the problem, this study was undertaken to examine some impacts of solid wastes disposal in Rewa city and to strategize for proper wastes disposal management. Proper management of Bio-medical waste is a concern that has been recognized by both government agencies and the Non government organizations. Several hazards and

toxic materials containing should be disposed off with proper take and care. Inadequate and inefficient segregation and transportation system may cause severe problem to the society hence implementing of protective measures, written policies all of these factors contribute to increased risk of exposure of staff, patients and the community to biomedical hazards.

REFERENCES

1. Fantola, A. and Oluwade, L. "Solid Waste Management in University of Ibadan", *African Journal of Science and Technology*, 1996; 2 (2): 25-46.
2. Matejicek, L. and Benesova, L. "Modeling of Environmental Pollution in Urban Areas with GIS: The 1st Biennial meeting of International Environmental Modeling and Software Society", Lugano, Switzerland, 2002; 61-66.
3. Askarian, M., Vakili, M. and Kabir, G. "Hospital waste management status in university hospitals of the Fars province, Iran". *Int. J. Environ. Health Res*, 2004; 14: 295–305.
4. Sangodoyin, A. Y. "Ground and Surface Water Pollution by Open Refuse Dumps in Ibadan, Nigeria". *Journal of Discovery and Innovation*, 1991; 3(1): 37-43
5. Baveja, G., Muralidhar, S. and Agrawal, P. "Hospital waste management—an overview". *Hospital Today*, 2000; 5(9): 485–486.
6. Marshal, E. 1995. "Analytic study to evaluate associations between dumpsites and birth effects". ATSDR CO.LTD: Atlanta.
7. Wrensh, M. 1990. "Hydrogeologic assessment of exposure to solvent contaminated drinking water". New York: Archives of environmental health.
8. Chitnis, V., Vaidya, K. and Chitnis, D. S. "Biomedical waste in laboratory medicine: Audit and management", *Indian Journal of Medical Microbiology*, 2005; 23(1): 6-13.
9. Dolk, M. 1997. "Residents near waste landfill sites and risk of non-chromosomal congenital malformations". EUROHAZCON: Collaboration study group, New York.
10. CPHEEO Hospital medical waste management practices in Mumbai. *Industrial Safety Chronicle*, Oct–Dec, 1998; 77.
11. Das, N. K., Sushant, P. and Jayaram, K. "A TQM Approach to Implementation of Handling and Management of Hospital Waste in Tata Main Hospitals". *The official Journal of the Indian Society of Health Administrator*, 2001; 11: 75-78.
12. United Nations Environment Program. Agency. 2006. "Informal Solid Waste Management". http://www.unep.org/PDF/Kenyawaste_mngntsector/sector/chapter1.pdf.
13. Malviga, K. 1999. "Existing Solid Waste Management from Hospitals". MSc Dissertation. Devi Alivya University, Indore, India.

14. Manohar, D., Reddy, P. R. and Kotaih, B. "Characterization of solid waste of a super speciality hospital – a case study". *Ind. J. Environ. Health*, 1998; 40: 319-326.
15. Neema, S. K. and Gareshprasad, K. S. "Plasma pyrolysis of medical waste". *Current Science*, 2002; 83: 3.
16. Rao, S. K. M. and Garg, R. K. "A study of Hospital Waste Disposal System in Service Hospital." *Journal of Academy of Hospital Administration*, 1994; 6(2): 27-31.
17. Rasheed, S., Iqbal, S., and Baig, L. A. "Hospital waste management in the teaching hospitals of Karachi". *J. Pak. Med. Assoc*, 2005; 55(5): 192–195.
18. WHO, 1996. Suggested guiding principles and practices for the sound management of hazardous hospital wastes. Regional consultation on sound management of hospital waste in Chiang Mai, Thailand.