# A Case Study of the Type and Quantity of Biomedical Waste Generated in Selected Health Units at Bengaluru City

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*Abstract:* Biomedical waste is a special category of waste which needs to be handles appropriately with precautions because it carries a higher potential for infection and injury that any other type of waste. Currently it is managed casually.

With a rapid increase in the number of hospitals, clinics and laboratories in the country the generation of biomedical wastes has been increasing considerably. In western countries it is estimated that hospitals generate are 200/Kg years. It is estimated patients in India generate between 0.5 to 1Kg of waste/person/day. In Karnataka state the generation of biomedical waste has been estimate to be 1.0Kg/bed/day in private and government health care establishments, 1.5/day in blood bank, 1.0/day in diagnostic laboratory, and 0.2Kg/day in small clinics and 0.25kg/day in veterinary clinics. Even the industry over the last decade has shifted from a mainly reusable product supply system (e.g.: glass syringes, hospital laundry etc.,) to a primarily disposable product supply system (e.g.: disposable syringes and needles, disposable hospital linen etc.,) which has caused an in the Bio-Medical waste generation and managing the same has become a problem (Acharya and sing Meet the book of hospital management).

According to World health organization (WHO) 2000 almost 80% of biomedical waste is comparable to domestic waste the remaining approximately 20% is considered hazardous waste as it may be infection, toxic and/or radioactive. Improve disposal of waste generated in health care establishment can have direct and indirect health impact on those who work in the health care establishment the general public and on the environment. Such practices may contribute to the spread of diseases as well as pollution of, soil and air. Untreated induction wastes dumped on the land can contaminate surface and ground water supplies and evening complete combustion of biomedical waste can lead to toxic emissions, thus exposing the entire population to the risk of diseases.

#### I. INTRODUCTION

Even after the implementation to Bio-medical wastes rules (management and handling) in July 1998, the condition remains more or less unchanged. It can be attributed to lack of knowledge, resources and enforcement of the regulations. The indiscriminate and unregulated dumping of bio medical waste (especially waste sharps) exposes the rag pickers. Waste handlers and children are playing in dumpsters to accidental injuries with needles and syringes.

Majority of the problem can be avoided if the biomedical waste management is properly managed. The Activities that are commonly done in the biomedical waste management are segregation, storage, collection, transportation and disposal of biomedical waste. It Planning, organizational, administrative, encompasses financial, legal, engineering aspects and human resource development and their management involves inter-disciplinary relationships.

While health care establishments and other hospitals in developed countries confirm to certain safety standards laid out by regulatory bodies on collecting, transporting and disposing of biomedical wastes, the same in not often true in developing countries where the level of awareness about the adverse impact of improper disposal of such waste is low, the regulatory tools are inadequate and the skills, resources and necessary motivation are absent.

Objectives of study:

- To study the type and quantity of biomedical waste generated in selected the health centers and health units at Bangalore city.
- To study the existing system of biomedical waste management in study area of the selected health centers and health units at Bangalore city.
- To propose suitable suggestion for an effective Biomedical waste management.
- The comparative study biomedical waste management in the health centers and health units at Bangalore city.
- To recommend the suggestion/modification of existing system of biomedical waste management if necessary.

#### II. LITERATURE REVIEW

There are many definitions concerning biomedical waste given by the workers in this area. Following is an attempt to list a few of them. Biomedical waste means "All the waste generated by hospital establishments, research facilities, and laboratories, In addition, it included the waste originating from "minor" or "scattered" sources such as that produced in the course of health care undertaken in the home (dialysis, insulin injections, etc)".Biomedical waste means "Any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining there to or in the production of testing of biological".

Biomedical waste is a waste generated during the diagnosis, treatment, and immunization of human beings and is contaminated with patient's body fluids (such as syringes, needle ampoules, organs and body parts, placenta, dressings, disposable plastics and microbiological wastes).

Biomedical waste generation according to national income level

National income level	Annual waste generation (kg/head of population)
High income countries All biomedical waste Hazardous biomedical waste	1.1-12.0 0.4-5.5
Middle-income countries All biomedical waste Hazardous health biomedical waste	0.8-6.0 0.3-0.4
Low income countries All biomedical waste	0.5-3.0

Biomedical waste in world generation according to source size

Source	Daily waste generation(kg/bed)	
University hospital	4.1-8.7	
General hospital	2.1-4.2	
District hospital	0.5-1.8	
Primarily health centre	0.05-0.2	

According to the WHO, the global life expectancy is increasing year after year. However, deaths due to infectious disease are increasing. A study conducted by the WHO in 1996, reveals that more than 50,000 people die every day from infections. One of the causes for the increasing infectious diseases is improper waste management. Blood, body fluids and body secretion which are constituents of biomedical waste harbor most of viruses, bacteria and parasites that cause infection. This passes via a number of human contacts, all of whom are potential 'recipients' of the infection. Human Immunodeficiency virus (HIV) and hepatitis viruses spearhead an extensive list of infections and diseases documented to have spread through bio-medical waste. Tuberculosis, pneumonia, Diarrheal diseases, Tetanus, Whooping cough etc. are other common diseases spread due to improper waste management.

# III. METHODODLOGY

## 1. Place and Duration of the Study:

The study covers 1 governmental hospital, 18 Nursing homes, 1 hospital and 2 diagnostic centers in Bangalore city and 1 Medical college teaching hospital, primary health centers and units in Bangalore city.

## 2. Procedures of Collection of Data:

- Prior permission was obtained from the hospitals for the study.
- The waste management practices were documented according to a pre-tested observation checklist developed for this purpose.
- Observations are documented separately by interacting with the concerned health care personal.
- The government Hospital, Nursing Homes & Diagnostic centers are studied to find out the Bio-Medical waste management interpremises
- We have taken the quantity of biomedical waste generated per day and we have taken the readings continuously for five days and average of these readings are taken.

## 3. Procedure Adopted In Treatment Unit:

We have visited the Bio-Medical waste treatment unit to gather the information on treatment of Bio-Medical waste. Collecting the waste from city for the treatment purpose. Bio-Medical waste is incinerated in pyrolytic type of incineration in the treatment plant.

The incinerator is consists of two cambers:

# *Primary Chamber:*

In the primary chamber wastes are get incinerated at a temperature of 800 degree centigrade to 900 degree centigrade and then gasses flows to secondary combustion chamber.

# Secondary Chamber:

In the secondary chamber the gaseous mixture is burnt at a high temperature of 1000 degree centigrade to 1000 degree centigrade. Then gases further obtained are conveyed to emission control system for the treatment.

# 4. Procedure Adopted in Disposal Site:

We have visited the Bio-Medical waste disposal site in which landfill is adopted as a disposal method, to collect the information on land filling operation. The ash obtained from the incineration process in treatment plant is sent to the disposal site for the final disposal. In the disposal site the trench method is using for the land filling purpose, the trench of required size is excavated, sand and gravel is filled layer by layer and then clay liners is placed over the trench and waste is dumped in to the trench and then it is covered with soil and the leachate producing are collected using leachate collection system.

#### IV. RESULTS AND DISCUSSIONS

The survey on Bio-Medical waste management was conducted during the period Jan 2019 to March 2019 in bangalore city. The survey was conducted using the format shown in the table .The results analyzed for Bio-Medical waste generation in Government Hospital, Nursing Homes and Diagnostic Centers as well as Medical College Teaching Hospital.

From the study, it was observed that, the waste generation rates differ from one to another depending upon bed strength and medical practices of the establishments. The Nursing homes and the Hospitals are directed to submit the annual report regarding their Bio-Medical Waste Management practices to the Karnataka State Pollution Control Board. The solid Bio-Medical Waste Generated in Hospitals and Nursing Homes were collected every day Morning by authorized organization, as safe disposal options. **Average Bio-medical Waste Produced in bangalore city** 

Sl. No.	Name of the Nursing homes	No. of beds	Waste produced (kg/day)
1	Nandini Nursing Home	50	1.456
2	Sudha Nursing Home	15	0.582
3	Shrinidhi Nursing Home	18	0.494
4	Santhathi Nursing Home	10	0.369
5	Vathsalya Nursing Home	75	5.418
6	Roopa Nursing Home	30	1.559
7	Prashanth Nursing Home	50	1.520
8	SumanaVinayaka Nursing Home	18	0.399
9	Ashwini Nursing Home	12	0.330
10	Ramkrishna Nursing Home	28	0.358
11	Matha Nursing Home	25	0.342
12	Mamatha Nursing Home	17	0.368
13	Cauvery Nursing Home	20	0.569
14	Krupa Nursing Home	18	0.381
15	Ashraya Nursing Home	18	0.358
16	Ravi Nursing Home	15	0.316
17	Seva Nursing Home	50	0.534
18	Shilpashree Nursing Home	18	0.392
19	Government Hospital	520	74.880
20	swathi Hospital	27	1.009
22	Diagnostic Center	Nil	0.480
23	Anu Diagnostic Center	Nil	0.325
Total			92.439

## V. CONCLUSIONS

- Most of the healthcare establishments and municipal authorities face difficulty in preparing the plan to manage biomedical waste, even though the biomedical rules and laws have been passed.
- Some of Health care centers is not properly managing the biomedical waste according to biomedical waste management and handling rules.
- In the healthcare establishments, the safety equipments like gloves, shoes, marks are provided to the workers who collect the wastes from different departments.
- Even though the biomedical waste management is a leading problem, there is a lack of awareness in the staff members, peoples and management.
- There is no proper inspection on biomedical waste management by the respective bodies, which leads to carelessness among the management of health care establishment.

#### VI. RECOMMENDATIONS

The health care establishments should have a holistic transparent approach in medical services, in order to achieve quality in disposal of Bio-Medical waste. This should include management of their waste in an environmental friendly manner.

To facilitate maximum safe resource, recovery transport & disposal, the segregation of waste has to be done properly.

Steps should be taken to setup common Bio-Medical waste treatment facility, because better sitting, management & monitoring is possible in common facility.

- The medical association should ensure that, their member units should comply with the various provisions of the Bio-Medical Waste (Management & Handling) rules, 1998.
- To change the attitude among the public, owners & employees of health care facilities towards Bio-Medical Waste management, efforts shall be made through awareness program.
- Periodic monitoring of the safe management of Bio-Medical Waste systems is recommended.
- Occupation health & safety to the health care personal should assume importance. Since, it is the health care's personal that are at immediate risk if waste were mismanaged.
- The liquid waste from the hospitals are left directly to sewers after disinfection but, after a period of time they will get react with the waste in the sewers and pose threat to the public hence, it has to be treated properly before discharging. The study has to be taken regarding this treatment of liquid waste from hospitals at least for duration of 6 months.

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#### REFERENCES

- [1]. Hand book of Operation and Maintenance of Hospital Medical Waste Incinerators", USEPA, EPA.No.625-6-89-024.
- [2]. Bio Medical Waste Fact by Dr. Virendar Pal Singh.
- [3]. Journal of Academy of Hospital Administration, July 1996.
- [4]. Bio Medical Waste (Management and Handling) Rules, 1998.

- [5]. Central pollution control board (2000), "Manual on Hospital Waste management", March 2000.
- [6]. ISHWMCON 2001," First Annual conference", India society of Hospital Waste Management, volume-1.
- [7]. Terry Grogan, (2003) "Solid Waste Reduction in US Hospitals-Case Study", Hospital Engineering and facilities Management.
- [8]. "Bio-Medical Waste Management", (June 2004), Environmental Management and Policy Research Institute (EMPRI).
- [9]. A.G.Chandorkar and B.S.Nagoba., (2004),"Hospital Waste Management", Para's medical publishers, 2 Edition.
- [10]. Park's Text book of Preventive and Social Medicine, Bhanot Publications, New Delhi, 18th End, 2005.
- [11]. Indian Journal of Forensic Medicine and Toxicology, Vol 1, 2007