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# A study on biomedical waste management in public and private hospitals in Chennai- Respondents responses on medical waste segregation

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**Abstract**
BMW means any waste generated in the process of diagnosis, treatment, immunization and research related to human beings and animals. Due to improper or poor waste management huge risk is posed to the health of public, patients, professionals and also cause environmental disturbance. The Union Ministry of Environment and Forests under the provision of Environment [protection] act, 1986 which brought the focus back on this issue. These rules apply to all the people who are connected to generation, collection, receiving, storage, transportation and handling or biomedical waste in any form. This article aims to highlight the responses of the respondents on Medical Waste Management segregation.

**Keywords:** bio-medical waste, infectious waste, segregation of waste, hospitals, Chennai

## Introduction

The World Health Organization (WHO) has defined "healthcare waste as all waste produced by healthcare establishments, research facilities and laboratories including the waste originating from minor or scattered sources such as that produced in the course of healthcare undertaken in the home (such as dialysis and insulin injections)" [1, 2].

The Bio-Medical Waste (BMW) (Management and Handling) Rules, was published in 20th July 1998, vide notification number S.O. 630 (E), by the Government of India in the erstwhile Ministry of Environment and Forests. It provides a regulatory frame work for dealing with bio-medical waste [3, 4, 5]. The term "bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining there to or in the production or testing of biological or in health camps, including the categories mentioned in Schedule I appended to these rules [6, 7, 8].

## Categories of biomedical waste

**Category no. 1**: Human anatomical waste (human tissues, organs, body parts) Incineration/deep burial

**Category no. 2**: Animal waste (animal tissues, organs, body parts, carcasses, fluids, blood, experimental animals, waste generated by veterinary hospitals, colleges, discharge from hospitals, animal houses) Incineration/deep burial

**Category no. 3**: Microbiology and bio-technology waste (wastes from laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell culture and infectious agents from research and industrial laboratories, wastes from production of biological, toxins, dishes and devices used for transfer of cultures) Local autoclaving/microwaving/ incineration.

**Category no. 4**: Waste sharps (needles, syringes, scalpels, blades, glass, etc., that may cause puncture and cuts. This includes both used and unused sharps Disinfection (chemical treatment/ autoclaving/ microwaving and mutilation/shredding)

**Category no. 5**: Discarded medicines and cytotoxic drugs (wastes comprising of outdated, contaminated and discarded medicines) Incineration/destruction and drugs disposal in secured landfills.

**Category no. 6**: Solid waste Items contaminated with blood and body fluids including cotton, dressings, plaster casts, linen, beddings, etc Incineration/autoclaving/microwaving.

**Category no. 7** Solid waste (wastes generated from disposable items other than the waste sharps such as tubing, catheters, intravenous sets etc) chemical treatment/autoclaving/ microwaving and mutilation/ shredding.

**Category no. 8**: Liquid waste (waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities) Disinfection by chemical treatment and discharge into drains.

**Category no. 9**: Incineration ash (ash from incineration of any biomedical waste) disposal in municipal landfill.

**Category no. 10:** Chemical wastes (chemicals used in production of biological, chemicals used in disinfection, as insecticides, etc.) Chemical treatment and discharge into drains for liquids and secured landfill for solids.

Waste management is collection, transportation, and disposal of garbage, sewage and other waste products. Waste management is

the process of treating solid wastes and offers variety of solutions for recycling items that don't belong to trash. It is about how garbage can be used as a valuable resource. The most important reason for waste collection is the protection of the environment and the health of the population. Rubbish and waste can cause air and water pollution. Rotting garbage is also known to produce harmful gases that mix with the air and can cause breathing problems in people.

Segregation refers to the basic separation of different categories of waste generated at source and thereby reducing the risks as well as cost of handling and disposal. Segregation is the most crucial step in bio-medical waste management. Effective segregation alone can ensure effective biomedical waste management.

- Segregation reduces the amount of waste needs special handling and treatment
- Effective segregation process prevents the mixture of medical waste like sharps with the general municipal waste.
- Prevents illegally reuse of certain components of medical waste like used syringes, needles and other plastics.
- Provides an opportunity for recycling certain components of medical waste like plastics after proper and thorough disinfection.

Medical services in Chennai are given by both government-run and private clinics. Chennai draws in around 45% of wellbeing vacationers from abroad showing up in the country and 30 to 40 percent of homegrown wellbeing travelers. The city has been named India's wellbeing capital. Multi-and super-strength emergency clinics across the city get an expected 150 global patients consistently. Variables behind the vacationers' inflow in the city incorporate low expenses, almost no holding up period, and offices offered at the strength clinics around there.

The clinical genealogy of the city started with the principal emergency clinic of India set up at Fort St. George on 16 November 1664 by Sir Edward Winter to treat debilitated warriors of the East India Company. The emergency clinic developed, extended, and moved out of the fortress to its current area in 1772, where it stands today as the Rajiv Gandhi Government General Hospital, and was opened to Indians in 1842. In 1785, clinical divisions were set up in Bengal, Madras, and Bombay administrations with 234 specialists.

## Statement of the Problem

There is a serious concern regarding hospital waste in Chennai city which has not been adequately managed. There is inadequate training of health care workers on hospital waste management practices. In addition, the waste handling behavior of the people itself is risky. Hospital workers staffs dispose off their waste as cheaply and as quickly as possible without recourse to the hygienic means of doing it. The importance of this study is to create the necessary awareness among health care workers as well as public to safeguard health and environment.

## Research Methodology

**Table 1**

| Primary Data Collection Method | Structured Questionnaires |
|---|---|
| Secondary Data Collection Method | E-Journal, E-Thesis and Websites |
| Sampling Method | Simple Random Method |
| Sample Area | Chennai City |
| Valid Sample Size | 200 |
| Statistical Tools Used | Frequency Distribution |
| Software | SPSS Statistics 20 |

An organized poll was coursed among 140 health laborers at emergency clinics in Chennai with 70 respondents from legislative clinic and 70 respondents from a private clinic individually. Straightforward random examining technique was utilized in this examination.

## Data analysis and Interpretation

### 1. Reliability Statistics

Cronbach's alpha is **a measure of internal consistency**, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability.

**Table 2:** Reliability Statistics

| Cronbach's Alpha | No of Items |
|---|---|
| 0.947 | 25 |

### Inference

The reliability for 25 items is 0.947. Even if one of the 25 items is deleted the Cronbach's Alpha value will be reduced. This indicates that the reliability for all items is higher.

### 2. KMO and Bartlett's Test

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is a statistic that indicates the proportion of variance in your variables that might be caused by underlying factors. High values (close to 1.0) generally indicate that a factor analysis may be useful with your data. If the value is less than 0.50, the results of the factor analysis probably won't be very useful.

Bartlett's test of sphericity tests the hypothesis that your correlation matrix is an identity matrix, which would indicate that your variables are unrelated and therefore unsuitable for structure detection. Small values (less than 0.05) of the significance level indicate that a factor analysis may be useful with your data.

**Table 3:** KMO and Bartlett's Test

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0.867 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 3300.151 |
| | df | 300 |
| | Sig. | 0 |

### Inference

Kaiser-Meyer-Olkin measure of sampling adequacy is 0.867 and Bartlett's Test of Sphericity and approximate Chi- square value is 3300.151 which are statistically significant at 5% level. Therefore, it can be concluded that the sample size is adequate.

## Background Information about The Study Respondents

**Table 4:** Respondents based on socio demographic factors

| Demographic | Variables | Government | Private | Total |
|---|---|---|---|---|
| **Gender** | Male | 35 | 35 | 70 |
| | Female | 35 | 35 | 70 |
| | Total | 70 | 70 | 140 |
| **Field of Work** | Doctor | 20 | 24 | 44 |
| | Nurse | 30 | 20 | 50 |
| | Laboratory Technician | 5 | 5 | 10 |
| | Quality Management | 2 | 1 | 3 |
| | X Ray Technician | 1 | 2 | 3 |
| | Pharmacist | 4 | 7 | 11 |
| | Cleaner | 3 | 5 | 8 |
| | X-Ray Doctor | 1 | 2 | 3 |
| | Anesthesia Technician | 1 | 1 | 2 |
| | Administrative | 3 | 3 | 6 |
| | Total | 70 | 70 | 140 |
| **Working Experience** | 1-3 Years | 17 | 30 | 47 |
| | 4-7 Years | 33 | 24 | 57 |
| | 8 Years & Above | 20 | 16 | 36 |
| | Total | 70 | 70 | 140 |

## Responses on Medical Waste Segregation

**Table 5:** Respondent's responses on Medical Waste segregation

| Based on Scale | Frequency | Percent |
|---|---|---|
| Strongly Disagree | 10 | 7% |
| Disagree | 50 | 36% |
| Neutral | 25 | 18% |
| Agree | 25 | 18% |
| Strongly Agree | 30 | 21% |
| Total | 140 | 100% |

**Inference:** The Above table shows 36% Disagree, 21% strongly agree, 18% of them are Agree and Neutral towards Medical waste are segregated.

## Medical Waste Segregation Practice in Hospital

**Table 5:** General Investigations on Medical Waste Segregation Practice in Hospital**.**

| Segregation Practice | Variables | Government | Private | Total |
|---|---|---|---|---|
| Who Segregate Medical Waste | Medical Staff | 15 | 10 | 25 |
| | Cleaning Worker | 25 | 23 | 48 |
| | Cleaning Worker and Medical Staff | 10 | 27 | 37 |
| | Don't Know | 15 | 7 | 22 |
| | Not Applicable | 5 | 3 | 8 |
| | Total | 70 | 70 | 140 |
| Place of Segregation | At the beginning near the source | 13 | 22 | 35 |
| | After waste is collected | 35 | 7 | 44 |
| | Waste storage place in hospital | 18 | 35 | 53 |
| | Don't Know | 4 | 6 | 10 |
| | Total | 70 | 70 | 140 |
| Are Container identified and distinguished | Yes | 25 | 33 | 58 |
| Are waste sacks subjected to tear | No | 35 | 25 | 60 |
| | Don't Know | 10 | 12 | 22 |
| | Total | 70 | 70 | 140 |
| | Yes Always | 17 | 25 | 42 |
| Are waste Sacks Fastened Properly | Sometimes | 26 | 13 | 39 |
| | Rarely | 8 | 9 | 17 |
| | No | 9 | 8 | 17 |
| | Don't Know | 10 | 15 | 25 |
| | Total | 70 | 70 | 140 |

| | | | | |
|---|---|---|---|---|
| | Yes Always | 23 | 13 | 36 |
| | Sometimes | 17 | 8 | 25 |
| | Rarely | 18 | 6 | 24 |
| | No | 10 | 27 | 37 |
| | Don't Know | 2 | 16 | 18 |
| | Total | 70 | 70 | 140 |
| Are their provisional measures to prohibit liquids running out from waste | Yes Always | 8 | 18 | 36 |
| | Sometimes | 6 | 13 | 19 |
| | Rarely | 13 | 23 | 36 |
| | No | 28 | 13 | 41 |
| | Don't Know | 15 | 3 | 18 |
| | Total | 70 | 70 | 140 |

**Inference**

The Above table shows General investigation on Medical waste segregation in hospitals, 48 respondents from Government and Private hospital responded Cleaning workers will segregate the waste, 53 respondents from Government and Private hospital responded waste will be stored in the storage place in hospital, 60 respondents from Government and Private hospital responded containers are not identified, 42 respondents from Government and Private hospital responded waste sacks subjected to tear, 37 respondents from Government and Private hospital responded No to waste sacks fastened properly and 41 respondents from Government and Private hospital responded No to Provisional measures to prohibit liquids running out from waste.

**Conclusion**

The proper hospital waste management system can help the control diseases can reduce community exposure to resistant bacteria, and could reduce HIV/AIDS and Hepatitis transmission from dirty needles and other improperly cleaned or disposed medical items. Regarding the environmental issues, a correct and sustainable management system of hospital waste will avoid the negative long term health effects, from the environmental release of toxic substances such as dioxin, mercury and others. From both volume and toxicity perspectives, the use of plastics in society is a focus of waste management concern. In the past, medical waste was often mixed with household waste and disposed of in municipal solid waste landfills. In recent years, increased public concerns over the improper disposal of hospital waste have led to a movement to regulate the waste more systematically and stringently by the Indian Government.

Bio medical waste management is more of human attitudinal issue than technological. The study revealed that the system of biomedical waste management is still suffering on lack of necessary knowledge and information regarding biomedical waste management system. The efficiency of transportation and storage need improvement. Bio Medical waste management is beyond just compilation of the data on process and enforcement of regulations; it has to be supported by appropriate education, training, commitment of health care staff within an effective policy frame work. Since environmental pollution has become a major concern with respect to the future of life on our planet it is legal duty of the management of the healthcare institution to ensure that bio medical waste are managed properly causing any adverse impacts on human health or environment.

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