

Study of Bio-Medical Waste Management in Surat City

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Abstract— There is wide spread concern and anxiety over dwelling, resources and deteriorating urban environment condition. Waste management is one major environment issue in urban areas. So far much work has been done relevant to solid waste management, but unfortunately hospital waste management has been neglected. The health hazard from hospital waste, pose great risk to ever increasing populace. The study is based on extensive literature review, in which, legal provision for Bio-medical waste management (BMWM) present practices of hospital waste disposal in different cities of India is studied. To study BMWM of Surat city, one of the six zones of Surat city was selected and different type of hospital – Government, trust and private hospital were surveyed in depth. From the survey of Bio-medical waste (BMW) generation in all zone, average occupancy ratio for different type of hospital and per bed waste generation according to the health care facilities provided by the hospital is found out and quantity of BMW of entire Surat city is estimated. Existing disposal practices of BMW are also studied critically. The primary data collation is based on detailed questionnaire survey and personnel interviews with Doctor, Hospital administrators, Nurses, Sanitary inspectors, Word boys. The present study through detailed field study intends to highlight these issues and the management options available to the concerned authorities.

IndexTerms—Bio-medical waste management (BMWM), hospital waste, Bio-medical waste (BMW)

I. INTRODUCTION

Environment and Health development issues have become major target areas where research and development efforts are to be concentrated in future. In recent years, there has been a growing awareness of the need for safe management of hospital waste. The management of health care waste is a subject of considerable concern to public health and infection-control specialists, as well as the general public.

Though, Ministry of forest and environment has promulgated practical guidelines, standards or rules to assist health care facilities in the effective management of these wastes, many hospitals and health care units are in-effectively managed. In particular, hazardous hospital wastes, when in-effectively managed may compromise the quality of patient care. Additionally these wastes present occupational health risk to those who generate, package, store, transport, treat and dispose of them. They also present environmental and public health risks through inappropriate treatment or disposal. There is not only an urgent need for action to solve the burning problems of hospital waste generation and its disposal, to achieve healthy Environment, but also the need to develop sound management programs for hospital wastes.

- **Category of Biomedical wastes (Rules of 2011)**

1. **Human anatomical waste** (Human Tissues organs Body Parts)
2. **Animal waste** (Animal Tissues, organs ,body parts Carcasses, animals used in research)
3. **Microbiology and Biotechnology waste** (Waste from Lab cultures, Vaccines, Animal cell Culture, Wastes from Biological productions, Dishes and devices used for transfer of culture)
4. **Waste sharps** (Needles, Syringes, Blades Glass etc)
5. **Discarded medicines & Drugs**
6. **Soiled waste** (Items contaminated with Blood and Body fluids in cotton, dressings, soiled plaster, linens , bedding)
7. **Infectious Solid waste** (Waste generated from disposable items other than waste sharps such as tubing , Catheters IV Sets etc)
8. **Chemical waste** (Disinfectants , Insecticides)

- **Colour Coding and type of Container for disposal of Biomedical wastes**

The different coloured bags for disposal of waste are shown in the photographs below. The photographs were taken from P.P. Savani Heart Institute, Surat.



Figure 1: various colour codes for various waste category

Table1: Colour coding for various category of waste

Colour Coding	Type of Container to be used	Waste Category Number	Treatment Option
Yellow	Non Chlorinated plastic bags	Category 1,2,5,6	Disinfect by chemical Rx or autoclaving or shredding
Blue	Non Chlorinated plastic bags container	Category 8	Chemical Rx and discharge into drains meeting the norms notified under these rules and solids disposal in secured landfill
Black	Non Chlorinated plastic bags	Municipal Waste	Disposal in municipal dumps sites
Red	Non Chlorinated plastic bags/puncture proof container for sharps	Category 3,4,7	Disinfect by chemical Rx or autoclaving/b mutilation or shredding

II. STUDY AREA

The city selected for the survey is Surat city. The surat is located on 21° north latitude and 72° west longitudinal on the banks of river tapi. The city is situated centrally on ahmedabad – Mumbai road at 260 kms north of Mumbai and 224 kms south of Ahmedabad.

- Zone Wise distribution of urban health centers (UHC) in Surat City

Table1: Zones of Surat city

LIST OF URBAN HEALTH CENTERS IN SEVEN ZONES					
Central zone (10)					
1	Kadiwala U.H.C. & MH	5	Sonifalia U.H.C. & MH	9	B.P. U.H.C.
2	Asarawala U.H.C. & MH	6	Lakhpati U.H.C.	10	Variavibazar U.H.C.
3	D.K.M. U.H.C. & MH	7	Maskati U.H.C.		
4	Khetarpa U.H.C. & MH	8	Mahidharpura U.H.C. & MH		
North zone (6)					
1	Singanpor, dabholi	3	Utran U.H.C.	5	Chhaprabhatha U.H.C.
2	Katargam U.H.C.	4	Ved Road U.H.C.	6	Kosad U.H.C.
South West zone (4)					
1	Althan U.H.C. & MH	3	Umra U.H.C.	4	Dumas U.H.C.
2	Panas/Athwa U.H.C.				
East zone (6)					
1	Hirabaug U.H.C.	3	Varachha U.H.C. & MH	5	Karanj U.H.C. & MH
2	Fulpada U.H.C.	4	Puna U.H.C.	6	Simada U.H.C.
South East zone (6)					
1	Limbayat U.H.C. & MH	4	Umarwada U.H.C.	6	Navanagar U.H.C.
2	Mithikhadi U.H.C.	5	SMIMER U.H.C.	7	Godadara U.H.C.
3	NavagamDindoli U.H.C				
South zone (3)					
1	Pandesara U.H.C. & MH	2	Udhna U.H.C.	3	Vadod U.H.C.
West Zone (3)					
1	Rander U.H.C. & MH	2	Adajan U.H.C. & MH	3	Palanpur U.H.C.

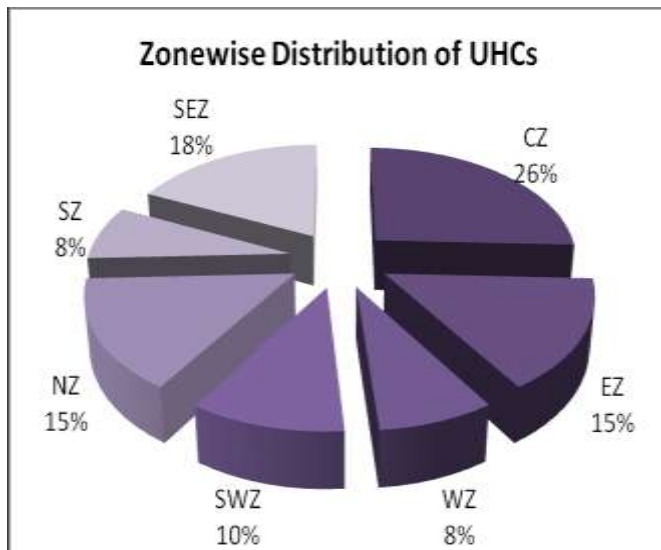


Figure 2: Zone wise Distribution of UHCs

III. METHODOLOGY

Total 514 hospitals including Government and Municipal corporation hospitals with 8992 beds are distributed in all seven zones. Majority of them are Maternity homes (148), followed by Nursing homes (80) and pediatric hospitals (73). For trauma care there are 57 surgical hospitals and 40 orthopedic hospitals. There are 23 general hospitals managed by trusts and are multispecialty hospitals. 24 hospitals are medical/physicians institution and the others group of 69 hospitals include hospitals like ENT, Ophthalmology, Cardiac and Ayurveda. Majority hospitals 40% are in Old city (CZ) area which contributes to 9% of total population

The analysis of the biomedical waste generation is carried out in following three ways

- (1) By comparing Government hospital with Private hospital
- (2) By comparing the different category or type of hospitals
- (3) By comparing the different waste category

For survey I visited many hospitals in different zones of the city and asked some questions to the Doctor, Hospital administrators, Nurses, Sanitary inspectors and Word boys. For that the questioner is made as shown below. Based on that I collected the data of waste generation in different health care units.

- **Questioner used for survey in different hospital**

- 1) Name of Health Care Unit
- 2) Address
- 3) Name of Ward
- 4) No. of ward
- 5) Type of Health care activities carried out
- 6) No. of Beds
- 7) No. of outdoor patients
- 8) Do you use Disposable or Reusable Items?
- 9) How many patients came affected by waste?
- 10) Reusable items are used then no. of reuses?
- 11) Whether items are disinfected after its use?
- 12) If yes, method of disinfected
- 13) Do you have Needle Crusher/ Needle Burner?
- 14) If yes, time of purchase
- 15) If no, which place waste is transported for disposal?
- 16) How you collect the waste & in which Bag you collect?
- 17) After collect the waste, how many days you keep this bag?
- 18) How many bags Collected per day?
- 19) In one bag how much weight of waste is collected?
- 20) How transportation of waste is done?

21) Would you like to join central Hospital wasteManagement plant?

IV. RESULTS AND DISCUSSION

From the survey of waste generation in different hospital and by asking the questions as shown above in the questioner sheet the following results were obtained.

- **By comparing Government hospital with Private hospital**

From the following chart, it is seen that Government hospitals produce maximum waste among all types.

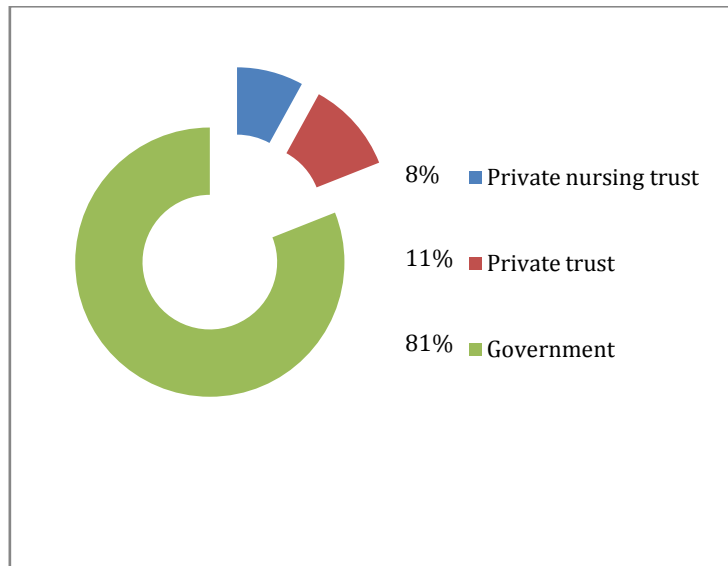


Figure 3: Waste Generation According to Ownership of Hospital

From following chart it is seen that Laboratories, having facility of microbiological, pathological and Hystopathological investigations, generates maximum waste per patient as human anatomical waste generation is very high from such laboratories. From orthopaedic hospitals, because of soiled plaster cast, the quantum of waste generated increases .minimum waste is generated from paediatric hospitals.

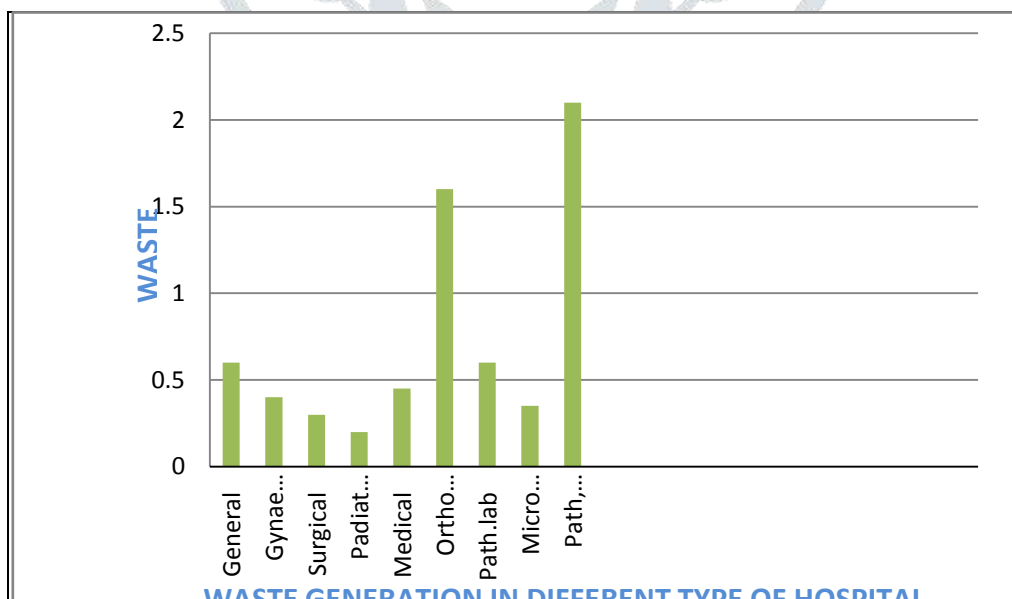


Figure 4: Waste Generation in different types of Hospital

Following Pie chart shows that generation of Soiled waste is max. among all types of waste hence due care should be taken in its disposal.

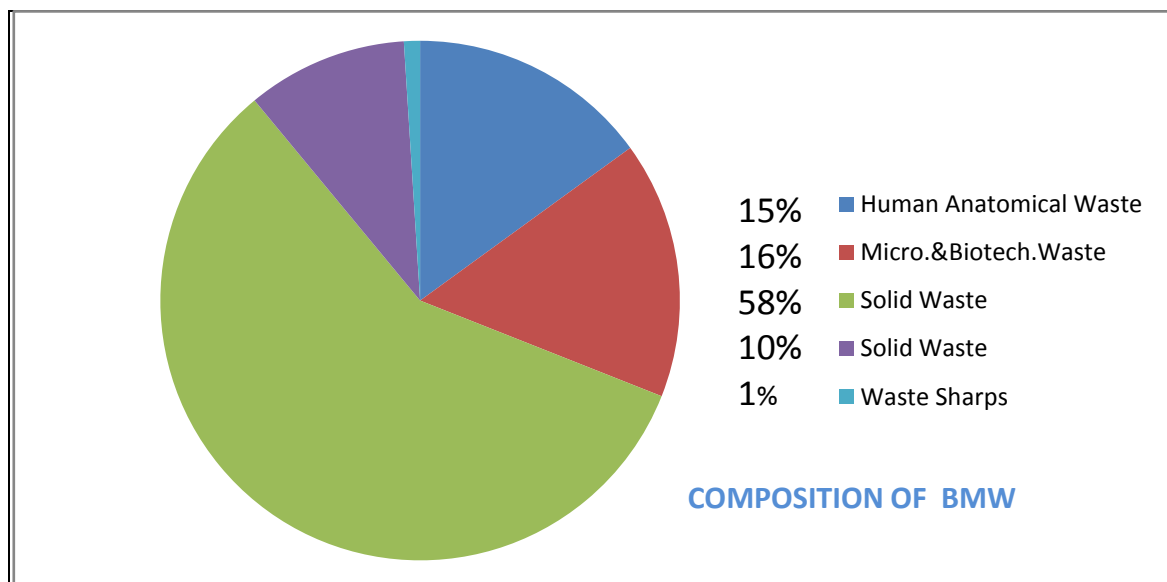


Figure 5: Composition of BMW

CONCLUSIONS AND RECOMMENDATIONS

From this study, following conclusions can be drawn:

- In most of the hospitals surveyed, the collection of BMW is not practiced as per required standards and majority of hospitals dump their wastes into nearby SMC bins without any treatment.
- The actual BMW of Surat will be more than the estimated quantity of 2200 kg/day as the quantity of waste generated from private clinics, dispensaries, laboratories, blood banks is not considered in the study.
- Practically, no hospital management keeps the record of the quantity of waste generated and how it is managed.
- In most of the hospitals and even in private units, there is no provision of essential facilities of protection like gloves, gum boots, masks etc to the waste handlers for handling and transportation of waste.
- The health risk and potential of spreading the diseases do not depend only on the quantity of waste but also depends on the potentiality of type of waste.
- In general, there is a lack of awareness about the serious effects and health hazard of infectious waste among the personnel handling this waste.
- Even doctors, nurses and paramedical staff do not have complete knowledge about management of BMW and hence a short term course of training for the same seems to be necessary.
- There is a need for separate unit for managing the BMW as the present staff is unable to cope up with the requirements BMWM.
- A central waste management plant seems to be better alternative in place of management waste by individual health care units. The same is the opinion of the doctors being interviewed during survey.

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