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Study on Waste Management Facility in Hospitals of Belgaum City

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Abstract: ***The objective of this paper is to identify the total number of hospitals and private clinics in the Belgaum city including labs, dental clinics etc and to find the quantity of bio-medical waste generation per day in Belgaum city. Secondly, Critical evaluation of existing management practices of bio-medical waste in leading health care centers in Belgaum and also to segregate the bio-medical wastes into infectious and non-infectious wastes and to find its quantity and present disposal methods. Thirdly to recommend some possible alternatives for sustainable management of bio-medical wastes to the local authority. To create awareness to the staff and the general public about the responsibilities and risks involved in dealing with highly dangerous BMWs.***

Keywords: Biomedical waste, disposal, segregation, infectious, management

I. INTRODUCTION

Biomedical waste originates from human or animal health care, medical research, medical teaching facilities, funeral establishments, laboratories and other facilities. A portion of that waste stream is infectious or potentially infectious and presents a potential hazard to the public health and the environment. Hospital is one of the complex institutions which is frequented by people from every walk of life in the society without any distinction between age, sex, race and religion. This is over and above the normal inhabitants of hospital i.e. patients and staff. All of them produce waste which is increasing in its amount and type due to advances in scientific knowledge and is creating its impact. The hospital waste, in addition to the risk for patients and personnel who handle these wastes poses a threat to public health and environment. Keeping in view inappropriate biomedical waste management, the Ministry of Environment and Forests notified the "Biomedical Waste (management and handling) Rules, 1998" in July 1998.

In accordance with these Rules, it is the duty of every "occupier" i.e. a person who has the control over the institution and or its premises, to take all steps to ensure that waste generated is handled without any adverse effect to human health and environment. The hospitals, nursing homes, clinic, dispensary, animal house, pathological lab etc., are therefore required to set in place the biological waste treatment facilities. It is however not incumbent that every institution has to have its own waste treatment facility. The rules also envisage that common facility or any other facilities can be used for waste treatment. However it is incumbent on the occupier to ensure that the waste is treated within a period of 48 hours.

II. STATEMENT OF THE PROBLEM

Of the total hospital waste generated, approximately 10% is hazardous, 85% is general (non risk) waste while a small percentage (5%) is labeled as highly hazardous. Currently, all the hospital's biomedical waste is being disposed along with collected in open containers without disinfection. Bandages, cotton and other items used to absorb body fluids are collected in plastic or other non-specified containers. Waste is collected in mixed form. Some hospitals in the country have developed their own system of color coding. Waste sharps are discarded without disinfection and mutilation, which may result in their being, re-used thus spreading an infection. The waste collection and transportation workers in the hospital segregate the recyclable material for sale. In a similar way, all disposable plastic items are segregated by the waste pickers, from where the waste is deposited either inside the hospital grounds, or outside in the community bin for further transportation and disposal along with municipal solid waste. Since the infectious waste gets mixed with municipal solid waste, it has potential to make the whole lot infectious in adverse environmental conditions (Info Nugget, 1996). Most biomedical waste generated from health care facilities are at present, collected without segregation into infectious and non-infectious categories and are disposed in municipal bins located either inside or outside the facility premises.

Wastes from operation theatres, wards and pathological laboratories are disposed of without any Disinfection/sterilization. Amputated body parts, anatomical wastes, and other highly infectious wastes are incinerated wherever incinerators are available; the remainder is burnt in some corner of the hospital grounds, mostly in open pits [1]. The segregation system may also not be changed

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to reduce the incinerable waste and ensure proper color-coding. Another category of waste is the untreated disposable and single-use items like syringes, IV catheters, medicine containers and wrappers. These too find their way into the garbage dumps, posing a serious risk to public health as well as a risk of scavenging. Medical waste, like syringes, body parts and gloves, are considered hazardous, since they can pass on infections and diseases.

Hospital waste still finds its way to road side heaps of rubbish, where it mixes with municipal solid waste rendering it hazardous for the environment and the public. Toxic emissions like dioxins, furan gases and carbon and sulphur particles from defective/inefficient incineration of chlorinated plastics from medical waste, cause modulation and disruption of growth factors, hormone, enzyme and developmental process. A draft report by the Environment Protection Act (EPA) estimates that as many as one in 1,000 of the most highly exposed people in the general population are at the risk of developing cancer because of dioxin.

Medical waste management requires commitment from persons at all the levels in the health care facility. According to World Health Organization (WHO), the human element is more important than technology in this field. Almost any system requires treatment and disposal by well-trained and well-motivated staff. A system that is managed by staff who do not understand the risks and the importance of their "contribution" is dangerous. Awareness regarding rules of disposal of biomedical waste needs to be instilled even among qualified medical personnel, including superintendents of hospitals and hospital administrators.

Proper handling may appear a costly affair, but it should always be remembered that at least 30%-40% of "add on" morbidity takes place because of improper disposal of hospital waste. A health care facility defeats the very purpose of its existence, if it adversely affects the health of its staff and community [2].

III. METHODOLOGY

A study was conducted in different health care settings. Data were collected from various hospitals. The hospitals are categorized according to number of beds as given by the Karnataka State Council for Science and Technology (KSCST), Bangalore

TABLE I Category of Hospitals

Number of Beds	Type of Hospital
0-100	Very small
101-500	Small
501-1000	Medium
>1000	Large

From all over the Belgaum city did survey and collected data (as per the questionnaire given by KSCST, Bangalore), of 06 hospitals and those hospitals are categorized as below,

TABLE II Categorization of Hospitals Studied

Name of the Hospital	Number of Beds in the Hospital	Type of Hospital
Dr Prabhakar Kore Hospital and Medical Research Centre, Belgaum	1990	Large
Belgaum Institute of Medical Science, Belgaum	740	Medium
Lakeview Hospital, Belgaum	110	Small
Belgaum Cancer Hospital Pvt Ltd, Belgaum	60	Very small
Deccan medical Centre, Belgaum	50	Very Small
Kasbekar Metgud clinic, Belgaum	42	Very Small

The Hospitals information of Belgaum is collected from the District Health Office, Belgaum. In the month of January survey was carried out using questionnaire and required data as per questionnaire was obtained from the hospitals mentioned above. The given data was cross checked with practices of handling and disposal of Bio medical waste in respective Hospitals. And also data was compared with the standards given by Bio medical waste management Rules 1998.

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Disposal sites of the various hospitals was observed and in the hospitals where proper disposal was not followed, the standard instructions were given to the in charge authority on storage, handling, transportation and disposal of the waste as per Biomedical waste management rules 1998(Ministry Of Environment And Forestry).

IV. RESULTS

Quantity of wastes generated per day in various hospitals

TABLE III Total Waste Generation at KLES Dr. Prabhakar Kore Hospital, Belgaum

Date of visit	Color of Bin	Qty of waste (Kgs /day)	Total waste (Kgs/day)
06-01-2011	Yellow(Infectious)	385	1920
	Red	730	
	Blue/ White	785	
	Black	20	
13-01-2011	Yellow	315	1770
	Red	685	
	Blue/ White	752	
	Black	18	
19-01-2011	Yellow	336	1766
	Red	660	
	Blue/ White	749	
	Black	21	
		Avg waste of 3days	1818.66 Kgs



Fig. 1 Pyrolytic Incinerator at KLES Dr Prabhakar Kore Hospital, Belgaum

The separately collected and transported non-infectious waste is put in the large municipal bins to be removed by the city municipal authorities. The final disposal of infectious bio-medical waste is carried out by incineration. Destromat Pyrolytic Incinerator Model PY-300 equipped with a 30-m high chimney with a load capacity of 1000 kg and 150-kg/h maintained in the incinerator is 800^0C over an 12 hour incinerating cycle (from 8 AM to 8 PM), having a break period of 12 hour for cooling and emptying the accumulated ash, before a fresh load of bio-medical waste is inserted. During incineration, the door of the incinerator is periodically opened and the waste material is turned upside down for complete incineration of the waste matter.

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TABLE V Total Waste Generation of Civil Hospital, Belgaum

Date of visit	Color of Bin	Qty of waste (Kgs /day)	Total waste (Kgs/day)
07-01-2011	Yellow(Infectious)	13.5	60
	Red	30.2	
	Blue/ White	15.5	
	Black	0.8	
14-01-2011	Yellow	16	58.3
	Red	27.2	
	Blue/ White	14	
	Black	1.1	
18-01-2011	Yellow	16	63
	Red	29	
	Blue/ White	17	
	Black	1	
		Avg waste of 3days	60.43 Kgs

They are following the standard color coded bins for collection and storage of waste. They are segregating the wastes at the point of source itself. The infectious waste is carried to the incinerator present in Khasbhag area Belgaum by a closed vehicle once in a day. The Khasbhag incinerator is being managed by Association of Hospitals and nursing Homes, Belgaum. They are charging 15 rupees per kg.



Fig. 2 Incinerator at Khasbhag, Belgaum



Fig. 3 Transportation and Segregation of the Waste at BHS Lakeview Hospital, Belgaum

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TABLE VI Total Waste Generation of BHS Lakeview Hospital, Belgaum

Date of visit	Color of Bin	Qty of waste (Kgs /day)	Total waste (Kgs/day)
06-01-2011	Yellow(Infectious)	2	12
	Red	2	
	Blue/ White	8	
	Black		
13-01-2011	Yellow	2.2	11.4
	Red	2.4	
	Blue/ White	6.8	
	Black		
19-01-2011	Yellow	2.1	10.9
	Red	1.8	
	Blue/ White	7	
	Black		
		Avg waste of 3 days	11.4 kgs

All the other hospitals in Belgaum city except KLES Dr. Prabhakar Kore Hospital are disposing their infectious wastes at the Khasbhag incinerator, Belgaum only.

TABLE VII Total Waste Generation of Deccan Medical Centre, Belgaum

Date of visit	Color of Bin	Qty of waste (Kgs /day)	Total waste (Kgs/day)
07-01-2011	Yellow(Infectious)	1	14.2
	Red	11.2	
	Blue/ White	2	
	Black		
14-01-2011	Yellow	1.5	14.6
	Red	10.8	
	Blue/ White	2.3	
	Black		
18-01-2011	Yellow	1.8	15.9
	Red	11.5	
	Blue/ White	2.6	
	Black		
		Avg waste of 3days	14.9 Kgs

TABLE VIII Total Waste Generation of Kasbekar Metgud Clinic, Belgaum

Date of visit	Color of Bin	Qty of waste (Kgs /day)	Total waste (Kgs/day)
08-01-2011	Yellow(Infectious)	0.5	5.7
	Red	3	
	Blue/ White	2	
	Black	0.2	
15-01-2011	Yellow	1.2	6
	Red	2.5	
	Blue/ White	2.3	
	Black	0.5	
21-01-2011	Yellow	0.9	6.85
	Red	3.2	
	Blue/ White	2.45	
	Black	0.3	
		Avg waste of 3days	6.188 Kgs

Since the Metgud hospital is having only 42 beds quantity of waste generated is very less and waste is carried to the Khasbhag

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TABLE IX Total Waste Generation of Cancer Hospital, Belgaum

Date of visit	Color of Bin	Qty of waste (Kgs /day)	Total waste (Kgs/day)
10-01-2011	Yellow(Infectious)	1	7
	Red	4	
	Blue/ White	2	
	Black		
17-01-2011	Yellow	1.2	13.2
	Red	8	
	Blue/ White	4	
	Black		
24-01-2011	Yellow	1.8	19.8
	Red	11	
	Blue/ White	7	
	Black		
		Avg waste of 3days	13.33 Kgs

Note: In a Belgaum city total biomedical waste from remaining hospitals which are not surveyed is taken approximately as 2000kgs per day and total infectious waste is taken as 300kgs per day.

Total quantity of waste generated in Belgaum city per day is 1994.93+2000=3994.93kgs per day. Out of this waste 702.45kg per day is infectious waste and need to be incinerated daily. Since Belgaum city is having two incinerators. One is situated in KLES Dr. Prabhakar Kore Hospital and another incinerator is situated in Khasbhag which is being managed by Association of Hospitals and nursing Homes, Belgaum. These two incinerators are sufficient to work for this quantity of waste generated, so there is no need to design one more incinerator for Belgaum city.

V. CONCLUSIONS

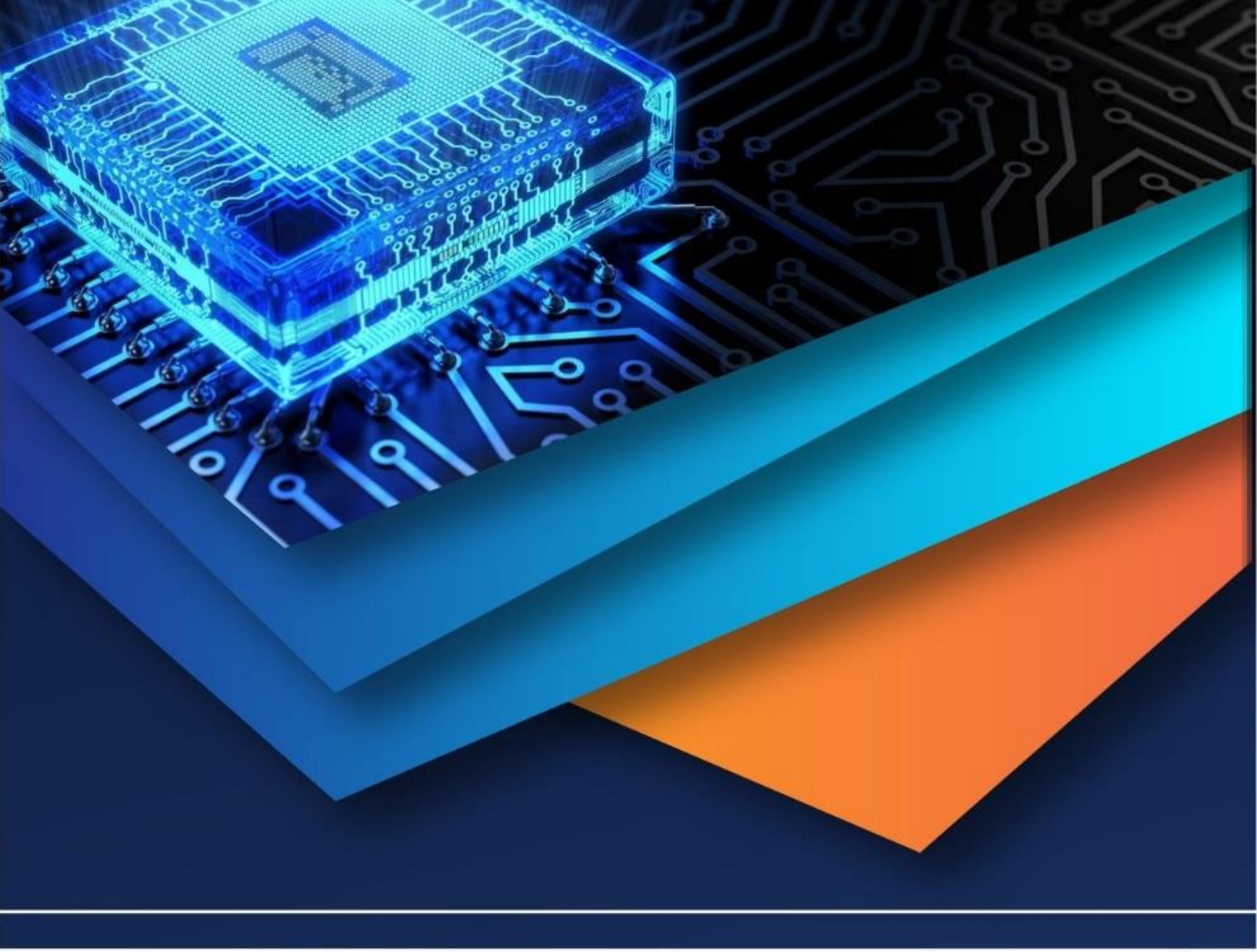
In the present study following conclusions were drawn,

A. The total number of hospitals in Belgaum city is 47, the number of clinics is 208, and number of nursing homes is 78.
B. At KLES Dr. Prabhakar kore hospital, total biomedical waste generated is 1900kgs per day and total infectious waste generated is 385kgs per day which is collected, stored in separate color bins and disposed by incinerators which is situated in the hospital vicinity only
C. The total biomedical waste generated from Belgaum city is 2166kgs. (Excluding kles Dr. Prabhakar kore hospital, Belgaum)
D. The total infectious waste generated from Belgaum city is 324.9kgs (excluding kles Dr. Prabhakar kore hospital, Belgaum) is disposed in a incinerator which is located at khasbhag area of Belgaum.

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