

ORIGINAL ARTICLE

EVALUATION OF BIO-MEDICAL WASTE MANAGEMENT PRACTICES IN A GOVERNMENT MEDICAL COLLEGE AND HOSPITAL

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ABSTRACT

Background: Biomedical waste (BMW) collection and proper disposal has become a significant concern for both the medical and the general community as improper management poses risks to the health care workers, waste handlers, patients, community in general and largely the environment.

Objectives: (i) Assessment of current Bio-medical waste management practices including collection, segregation, transportation, storage, treatment and disposal technologies in tertiary health care center. (ii) Assessment of health and safety practices for the health care personnel involved in Bio-Medical Waste Management.

Materials and Methods: Waste management practices in the Government Hospital was studied during March 2009 – May 2009. The information / data regarding Bio-Medical Waste Management practices and safety was collected by way of semi-structured interview.

Results: M.L.B Medical College generates 0.52Kgs waste per bed per day and maximum waste is generated in wards. The institute has got separate color coded bins in wards for collection of waste but segregation practices needs to be more refined. The safety measures taken by health care workers was not satisfactory, it was basically due to un-awareness of health hazards which may occur because of improper waste management practices.

Conclusion: Thus it is concluded that there should be strict implementation of a waste management policy set up in the institute; training and motivation must be given paramount importance to meet the current needs and standards of bio-medical waste management.

Keywords: Biomedical waste management, Evaluation, Waste treatment facility.

INTRODUCTION

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⁽¹⁾.

During last few decades, the need for better health-care 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 health care settings, which are meant to restore and maintain community

health, are also threatening their well-being. Poor waste management practices pose a huge risk to the health of the public, patients, professionals and contribute to environmental degradation⁽²⁾. Issues of improving the management of biomedical wastes are receiving increasing attention throughout the world since healthcare institutions generate tons of biomedical waste each year. Due to the lack of investment and infrastructure, in some cases, waste water discharged from hospitals often runs directly into nearby water bodies and improperly discharged wastes to sewers generates waste water potentially dangerous to handlers. Moreover, most hospital do not have incinerators and even if they are, not designed for the disposal of large quantities of waste and consequently have become overloaded, causing air pollution in surrounding areas. Thus poor waste management practices pose a huge risk to the health of the public, patients, professionals and contribute to environmental degradation.

According to "Biomedical Waste" (Management and Handling) Rules, 1998 of India BMW means "any waste which is generated during the diagnosis, treatment or immunization of human- beings or animals or in research activities pertaining thereto or in the production or testing of biological and including categories mentioned in schedule-I."

Though 75-90% of the waste produced by health care institutions is non-risk being generated from administrative and housekeeping/ maintenance of health care establishment , the remaining 10-25% waste is regarded as 'hazardous' and may create a variety of health risks . According to WHO 85% of hospital waste is nonhazardous, 10% infective and remaining 5% non infective but hazardous.

The scientific " Hospital waste Management " is of vital importance as its improper management poses risks to the health care workers, waste handlers, patients, community in general and largely the environment. Keeping this in view, bio-medical waste management at this tertiary care Government set up was studied.

OBJECTIVES

1. To assess the quantum and different kind of waste generated in tertiary care Government Hospital and
2. To assess the practices adopted for collection, segregation, storage,

transportation, treatment and disposal of biomedical waste and suggest measures for streamlining the hospital waste management in tertiary care hospital setting.

MATERIAL AND METHODS

The study was carried out in 650 bedded Government Medical College - M.L.B. Medical College Jhansi. It was a Hospital based study conducted during March - May 2009. A survey of various hospital areas was done to study the process of collection, segregation, storage, transportation, treatment and disposal of hospital waste.

Tools used for the study:

Data Collection: (i) The information / data regarding Bio-Medical Waste Management practices and safety was collected by way of semi - structured interview, with the Medical Superintendent of the hospital, proforma being the one used for waste. Auditing questionnaire.- (ii) Information derived from interview was verified by personal observations of Biomedical waste management practices in each ward of hospital, starting from source, handling, collection, transportation, and final disposal on every alternate days for a period of three months. The statistical technique used for the analysis of the collected data was estimation of simple percentage.

RESULTS

Table 1: Record of Bio-Medical Waste generated per day in Kg

Department	Black bag	Yellow bag	Red bag	Blue bag
T.B. & chest	6	--	--	1
Gynae ward	10	--	--	5
Gynae OT/Labour room	6	8	8	4
Ortho ward	9	--	4	5
Pediatric ward	7	--	2	2
NICU/PICU	5	--	5	1
Cardiac / Cath. Lab	8	--	--	7
Medical Ward	9	--	4	5
ICU	8	--	6	5
OT	9	14	7	7
Central Lab	8	--	3	7
OPDs	7	--	2	5
Blood bank	9	--	2	5
Others	6	5	3	2
Total	241 Kg/day			

Bio-medical waste generation in M.L.B Medical College and Hospital depends on different sites, described in table 1.

Waste produced = $\frac{\text{Mean waste generated/day}}{\text{No. of beds}}$
per bed per day

Since the bed occupancy rate of the hospital is 70%

Waste produced per day = 0.52 kgs

This is comparatively less than as suggested by previous studies which suggests that most hospitals in India generate 1-2kgs per day, and the tertiary care hospitals as AIIMS, produces on much higher side. In-patient areas contribute to 71.6% of waste generated.

Table 2: Evaluation at the level of Segregation of Waste

Observation	Bags observed in different hospital sites				Total N= 111 (%)
	Black bag N= 30 (%)	Yellow bag N=27 (%)	Red bag N= 27 (%)	Blue bag N=27 (%)	
Located at right place	15 (50)	12(44)	11(41)	7(26)	45(41)
Placed on stand	3(10)	3(11)	0(0)	0(0)	6(5)
Contains waste as in schedule I	9(30)	14 (52)	11(41)	9(33)	43(39)
Respective bins fitted with closed fitting cover	3(10)	13(48)	3 (11)	0(0)	19(17)
Labeling of Bags as in Schedule III	30(100)	27(100)	27(100)	27(100)	111(100)
Daily disinfection of bins with 1% hypochlorite solution	0(0)	0(0)	0(0)	5(19)	5(5)
Collected daily	30(100)	27(100)	27(100)	27(100)	111(100)

The color-coded bins were not placed on stand as well as closed fitting covers on them were missing in majority of wards. The Central Pollution Control Board specify segregation of infectious waste strictly, black colored bags for general waste whereas yellow colored for infectious waste⁽³⁾. This was not strictly adhered to as in only 43% of observed sites had segregated waste according to guidelines and inspite of presence of bags, but inadequate knowledge regarding segregation, majority of Biomedical waste was disposed of in Black bags which was treated as general waste thus causing a great threat to society. However all the bins were labeled accordingly as in Schedule III. Only 5(5%) bins placed in operation theatre and Gynecology wards were disinfected daily with 1% hypochlorite solution and in rest of the wards disinfection of bins was carried out once in 3-4 days. The waste generated in each ward was collected by in-service sanitation staff (about 3-4 sweepers) in each ward which was collected by private agency appointed on contract by the college for the waste treatment. The segregation practices of waste were not satisfactory as it was primarily done by sweepers only.

The Bio-Medical waste generated was transported by manual lift by the waste handlers to the agency workers given contract for the waste treatment. The waste was transported

usually in the morning hours, however there was no separate route for transportation of waste and neither the trolleys for proper transportation.

Table 3: Observation at level of Transportation and Storage Facilities of Waste

Separate route for transportation of Waste	No
Separate timings for transportation of BMW and general waste to avoid mixing of waste	No
Trolley used for transportation of BMW separately	No
Separate room for storing waste after collection	Yes
Storage area impermeable with supply of water	No
Storage room locked to prevent entry of unauthorized person	No
Weighing machine present in storage room	Yes
Waste not stored for more than 48 hrs.	Yes

Bio-Medical waste collected each day was stored at a single dumping site near incinerator in a open space, where from it was taken to incinerator. The yellow bag was incinerated and the incineration ash left behind was dumped in black bags, in the remote pit in the medical college itself.

Table 4: Personal Protective Clothing worn by Waste handlers/Sweepers (n=56)

Personal protective clothing	Number (%)
Gloves	17 (30)
Apron	0 (0)
Long boot	0 (0)
Eye shield	0 (0)
Mask	6 (11)

Table 5: Training and Practices of waste handlers (n=56)

Training and other particulars	Number (%)
Received special training in bio-medical waste handling	8(14)
Sensitization workshop on BMW management in the last 6 months	0 (0)
Aware of risk involved in BMW handling	8 (14)
Hepatitis B vaccination received	3 (5)
Any injury / infection in past 6 months	4 (7)
Accidents reported to higher authority	0 (0)

The safety practices adopted by the sanitation staff for collection of Bio-Medical waste are rudimentary. Only 30% sweepers were using gloves while managing wastes, whereas apron, long-boots, eye-shields was worn by none. This was basically because of unavailability of Personal Protective equipments as well as unawareness of health hazards to which they are exposed to while handling such waste. Only 3(5%) workers were immunized for Hepatitis - B.

Regarding sensitization of Bio-Medical Waste management practices only 14% sweepers who are actual waste handlers were trained for waste management practices and were aware of risks involved in waste handling. 86% sweepers denied to have undergone any reorientation related to hospital waste management. Four (7%) workers reported of prick injury during segregation of waste in the past six months.

Waste Treatment Practices

Regarding treatment of waste the needles and sharps were first autoclaved and then buried in pits of dimension 4ft x 4ft. after disinfection. The institute has incinerator plant for management of yellow bags. The Black bags were disposed of by the municipality as the general waste. The major problem in the waste disposal was at the

level of segregation as infectious waste was also found mixed with general waste thus causing a great threat.

DISCUSSION

M.L.B Medical College generates 0.52 Kgs waste per bed per day and maximum waste is generated in wards. The waste generated is comparatively less as was found in a study at "Sher- I- Kashmir" Institute of Medical Sciences, Srinagar for a period of three months which showed that quantity of, solid waste generated per bed per day was found to be 2.02Kgs. Inpatient area generated maximum solid waste (71.6%) followed by supportive services. Other areas like Operation Theatre, Emergency and O.P.D together produced lesser amounts (12.9%).

Chauhan and Malviya (2002) analyzed solid waste management practices in sixteen hospitals of Indore city and found that hospital authorities think 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 a low priority.⁽⁴⁾

In the present study, though majority of black bags were carried by Municipal corporation , but during storage rag pickers used to collect needles, disposed drugs, syringes and PVC items from the bags, which used to be present in them because of poor segregation practices followed. Similar findings were seen in a study at S.N Medical College Agra by S.V.S Chauhan and S. Sharma that found many garbage dumps, in and around the health care facilities, which have been frequently visited by rag pickers. This practice not only encourages disposables being repacked and sold without proper disinfection but they also expose themselves to injuries with sharps and other infections. These findings are also in agreement with those of Nema and Ganesh prasad (2002). They had observed that except for a few Hospitals, waste is mostly dumped in the open space enabling rag Pickers to collect syringes, cotton, plastics etc. In many hospitals, medical waste is burnt at dumpsites in an open environment ⁽⁵⁾.

The safety measures adopted by the waste handlers was very poor, with only 30% using gloves and 11% masks while handling the Biomedical waste . Eyeshields, aprons, long boots were worn by none. The observation of

the present investigation is in accordance with that of Henry et al. who performed a study at two privately owned community hospitals in two suburbs of Minneapolis and observed less than optimal levels of compliance of personal protective clothing among health care workers⁽⁶⁾. Of the total only 14% of health care workers received special training on this aspect and were aware of the risks of handling Biomedical waste management. Similar findings were found in a study carried out at Sarojini Naidu Medical College, Agra, that 20 (37.04%) waste handlers were aware of the risk involved in biomedical waste handling, none had received any special training on this aspect.

CONCLUSION

Though the waste management practices in the hospital has improved as compared to other state medical colleges lacking the facility of incinerators etc. still the waste management activities like collection, segregation, transportation, treatment and disposal need to be done on more scientific basis.

In the waste management process, segregation practice needs to be practiced more strictly and by the waste generators itself. Day to day collection of waste was done but there is no separate route for transportation of waste. Regarding treatment of waste the institute has got its own incinerator plant.

The safety practices adopted by the sanitation staff for collection of Bio-Medical waste were rudimentary. Only 30% sweepers were using gloves while managing wastes, whereas apron, long-boots, eye-shields was worn by none. This was basically because of unawareness of health hazards to which they were exposed to while handling such waste Personal Protective equipments along with the superimposed unavailability of the adequate quantities of personal protective measures. Only three (5%) workers were immunized for Hepatitis -B. Regarding sensitization of Bio-Medical Waste management practices only 14% sweepers were trained for waste management practices and were aware of risks involved in waste handling.

RECOMMENDATIONS

Following recommendations were made for improving the waste management practices of the hospital

- Segregation should start at the source of generation and by the generator itself
- Proper labeling of the waste should be done.
- Transportation of Black and Yellow bag should preferably be done separately to avoid mixing of waste.
- Transportation should be done in closed trolleys and by separate route.
- Sensitization of waste generators and health care providers should be done more frequently, and separate sensitization programs should be organized for sweepers and fourth class health care workers in local language emphasizing the importance of using personal protective measures and immunization for Hepatitis B.
- Last but not least is effective implementation of rules by surprise visits and inspection by appropriate authorities and fixing accountability of each and every person involved in management of Bio-Medical waste.

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