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Original Article

Microbiology Section

Bio-Medical Waste Managment in a Tertiary Care Hospital: An Overview

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ABSTRACT

Introduction: Bio-Medical Waste (BMW) management is of utmost importance as its improper management poses serious threat to health care workers, waste handlers, patients, care givers, community and finally the environment. Simultaneously, the health care providers should know the quantity of waste generated in their facility and try to reduce the waste generation in day-to-day work because lesser amount of BMW means a lesser burden on waste disposal work and cost saving.

Aim: To have an overview of management of BMW in a tertiary care teaching hospital so that effective interventions and implementations can be carried out for better outcome.

Materials and Methods: The observational study was carried out over a period of five months from January 2016 to May 2016 in Chhatrapati Shivaji Subharti Hospital, Meerut by the Infection Control Team (ICT). Assessment of knowledge was carried out by asking set of questions individually and practice regarding awareness of BMW Management among the Health Care Personnel (HCP) was carried out by direct observation in the workplace. Further, the total BMW generated from the present setup in kilogram per bed per day was calculated by dividing the mean waste generated per day by the number of occupied beds.

Results: Segregation of BMW was being done at the site of generation in almost all the areas of the hospital in color coded polythene bags as per the hospital protocol. The different types of waste being collected were infectious solid waste in red bag, soiled infectious waste in yellow bag and sharp waste in puncture proof container and blue bag. Though awareness (knowledge) about segregation of BMW was seen in 90% of the HCP, 30%-35% did not practice. Out of the total waste generated (57912 kg.), 8686.8 kg. (15%) was infectious waste. Average infectious waste generated was 0.341 Kg per bed per day. The transport, treatment and disposal of each collected waste were outsourced and carried out by 'Synergy' waste management Pvt. Ltd.

Conclusion: The practice of BMW Management was lacking in 30-35% HCP which may lead to mixing of the 15% infectious waste with the remaining non-infectious. Therefore, training courses and awareness programs about BMW management will be carried out every month targeting smaller groups.

Keywords: Health care providers, Infectious, Waste disposal

INTRODUCTION

The Bio-Medical Waste (BMW), is defined as any waste generated during diagnosis, treatment or immunization, of human beings or animals or in research activity [1,2]. The waste produced in the course of healthcare activities has a great potential and possibility for causing injury and infection than other type of waste [3]. As per the recent BMW Management Rules, 2016 [4] these rules apply to all persons who generate, collect, receive, store, transport, treat, dispose or handle BMW in any form including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories, blood banks, Ayush hospitals, clinical establishments, research or educational institutions, health camps, medical or surgical camps, vaccination camps, blood donation camps, first aid rooms of schools, forensic laboratories and research leboryatories by whatever name they are called to take all the steps to ensure that such waste is handled without any adverse effect to human health and environment.

According to WHO 2009 [5], around 85% of the hospital waste is non-hazardous, 10% infective and remaining 5% non-infective but hazardous. Management of infectious waste is a major challenge to the hospitals. A study on assessment of healthcare waste generated by Government Hospitals in Agra found out that most of the hospitals, nursing homes and pathological laboratories dispose of the waste in their neighbourhoods due to lack of awareness, inadequate services, limited utilization of existing facilities, lack of adequate institutional arrangements, operation inefficiencies and nodal authorities inefficiency in performing their task effectively [6]. Improperly managed BMW is a potential risk factor for the Health Care Personnel (HCP), the community and environment.

The health care providers should also know the quantity of waste generated in their facility so that appropriate measures can be taken to reduce the waste generation in day-to-day work because, lesser amount of BMW means a lesser burden on waste disposal work and cost saving. Lack of data regarding awareness of BMW management among HCP and also the day-to-day generation of different category of infectious waste from our hospital prompted us to carry out this study.

MATERIALS AND METHODS

The BMW management at an 1100 bedded Chhatrapati Shivaji Subharti Hospital (CSSH), a tertiary care teaching hospital in Meerut City was carried out by the Infection Control Team (ICT) and Hospital management. The observational study was carried out for a period of five months from January 2016 to May 2016. The approval from the Institutional Ethical and Research Committee was obtained before conducting the study. The ICT surveyed different areas of the hospital such as Wards, ICUs, Emergency, Operation theatre, Laboratories, and Central Sterile Supply Department (CSSD) to observe the process of segregation of the waste at the site of generation. The emphasis was to see whether the segregation of BMW at the site of generation was carried out in separate colour coded bags as per the hospital protocol. The assessment of knowledge regarding management of BMW was carried out by asking set of prepared questions individually to the HCP by the ICT members in the daily round. However, monitoring of practice of BMW Management was carried out by direct observation at the workplace.

The ICT also inspected the central waste storage area of the hospital. In the storage area the waste was weighed and the individual

weight (both infectious and non-infectious) was documented. The total infectious waste generated in kilogram per bed per day was calculated as follows: first, mean waste generated per day was calculated by dividing the total waste produced during the study period (that is sum of waste in red bag + yellow bag + puncture proof container/blue bag) by number of days of the study. Further, the mean waste generated per day was divided by the number of occupied beds to calculate the BMW generated in kilogram per bed per day. The transportation, treatment and disposal of hospital waste in CSSH were carried out by M/s. Synergy Waste Management Pvt. Ltd., New Delhi, as per the Memorandum of understanding (MoU) signed.

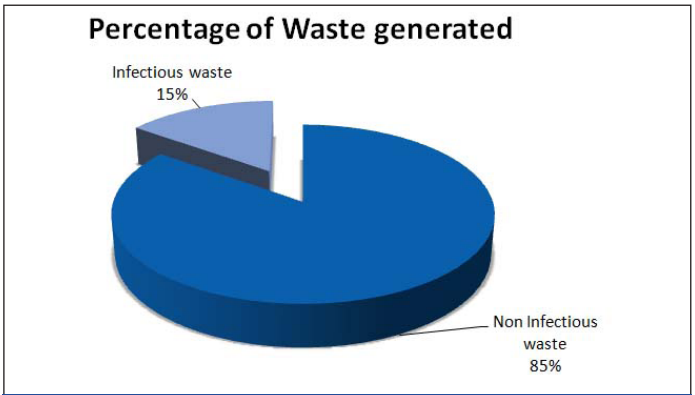
RESULTS

In our hospital the segregation of BMW was being done at the site of generation in colour coded polythene bags as per the BMW (management and handling) Rules, 1998 [2] For the convenience of the staff the colour coded bags were being placed inside similar colour coded bins and coloured posters showing the segregation of BMW in local language were being displayed at the site of segregation of waste in the hospital. Knowledge regarding segregation the BMW was observed in approximately 90% of the HCP. However, 30-35% HCP committed that, they did not practice segregation in spite of the knowledge resulting into mixing of BMW, which is a matter of concern. Various reasons were given for the same.

The different type of waste generated from our hospital was: infectious solid waste such as catheters, intravenous sets, gloves, universal containers, urine bags, syringes without needles, vacutainers, cartridge, dropper, tips, rapid cards and culture plates collected in red coloured plastic bags. The soiled waste such as cotton, dressings, plaster casts, swabs, masks, cap, dipstick, discarded medicines, cytotoxic drugs, human anatomical waste and animal waste collected in yellow coloured plastic bags. Sharp waste such as needles, needles from needle tip burner, scalpels, blades, lancet, glass slide, coverslips, broken glass, tubes or any other contaminated sharp object that may cause puncture and cuts such as used and unused sharps (reagent/chemical bottle/IV infusion bottles) collected in puncture proof, leak proof translucent containers/blue bag. Finally, the general waste such as paper, packing material, general municipal waste and leftover food was collected in black plastic bag.

The segregated waste from the site of generation were being transported through chute to the carts placed at various points in the hospital premises by skilled sanitary workers taking universal precautions and taken to the storage area in the hospital. From the storage area the wastes were being transported to the treatment and disposal site by the skilled workers of 'Synergy'. It was also observed that Clinical Microbiology laboratory autoclaves part of its infectious waste (culture and sensitivity plates) locally in the dedicated autoclave after putting the plates in an autoclavable Hi-Dispo Bag (Hi media Laboratories Pvt. Ltd, Mumbai) at 121°C and 15 pounds per square inch (psi) pressure for 60 minutes before handing over to synergy in red bag. A vehicle (minivan) labeled with Bio-hazard symbol transports these colour coded bags from the storage site to the authorized treatment and disposal facility near the hospital premises.

Each colour coded bags were weighed and weight was documented before transportation. During the study period the total waste generated (infectious + non-infectious) from our hospital was 57912 kgs. Out of which, 15% (8686.8 kg) was infectious waste and 85% (49225.2 kg) was non-infectious waste as shown in [Table/Fig-1]. The average infectious waste generated from our hospital per day was calculated as 289.56 kg. Owing to the number of occupied beds (n=850), the average infectious waste generated per bed per day was found to be 0.341kg as shown in [Table/Fig-2].



[Table/Fig-1]: Distribution of infectious and non-infectious health care waste generated in a tertiary care teaching hospital.

Health care facility	Total no of occupied beds	Infectious waste generated / month	Infectious waste generated / day	Infectious waste generated / bed/day
CSS Hospital	850	8686.8kg	289.56kg	0.341kg

[Table/Fig-2]: Infectious waste generated per day in a tertiary care hospital.

Colour code	Waste	Amount in Kg.
Yellow	Total waste generated /month Total waste generated /day	6954.4 231.81
Red	Total waste generated /month Total waste generated /day	928.0 30.93
White (translucent) / Blue (sharp)	Total waste generated /month Total waste generated /day	804.4 26.81

[Table/Fig-3]: Distribution of different category of health care waste generated per day in a tertiary care hospital.

Distribution of various category of infectious waste (that is waste collected in red bag, yellow bag, and puncture proof container is elaborated in [Table/Fig-3]. The maximum waste generated from our hospital was soiled infectious waste in yellow bag (6954.4kg/month and 231.81kg/day) followed by solid infectious waste in red bag (928.0kg/month and 30.93kg/day) and sharp waste in translucent puncture proof container (804.4kg/month and 26.81kg/day).

DISCUSSION

Segregation is an important pre-requisite in the entire process of waste management. Proper segregation of BMW was practiced in majority of the areas in our hospital highlighting the effectiveness of education by the Infection Control Committee. In our hospital members of the ICT take regular classes in small groups to keep the rotating staff aware about the BMW management. The Infection Control Nurse (ICN) and the floor in-charge also take a daily round of various areas in the hospital to monitor the waste management. To increase compliance towards BMW management in our hospital, the following was done: i) coloured posters showing the segregation of BMW in local language was being displayed at the site of segregation in all the areas of the hospital so that it is easy for the staff to refer to, in case of doubt; and ii) colour coded bags were being placed inside similar colour coded bins for the convenience of housekeeping staff and the care givers.

In our hospital though 90% of HCP were aware about the segregation of BMW and its importance, approximately 30-35% HCP did not practice segregation resulting into mixing of the infectious waste with general waste which is definitely a matter of concern because the hospital wastes contain infectious wastes which if not properly disposed off pose a great health risk to the public. Various reasons were given for the non-compliance such as location of bins away from working area, time pressure due to too much work load, work pressure due to unexpected staff leave, casual attitude because nobody is watching you. It was observed that the HCP passed the blame of improper segregation of BMW generally to staff on night duty. Besides the staff, mixing of the general waste with the infectious

waste was also being done by patients care givers in different areas of the hospital. Thus, emphasizing the need to even educate the patients care givers about BMW management, which is a herculean task due to floating patient population. Thus, implementation of BMW management in a large tertiary care hospital like ours, is a huge responsibility and a non-rewarding area both for the ICT and the management.

In our hospital a total of 85% waste produced was non-infectious general waste and only 15% were infectious. Similarly, Sharma et al., also reported that between 75% and 90% of the waste produced by healthcare facilities is general waste [7]. Thus, if segregation is not practiced the infectious 10-25% may mix up with the general waste and render it infectious. Improper waste management can lead to pollution in the environment (air, water, soil), unpleasant smell, can foster the growth and multiplication of rodents, insects and worms, and may lead to transmission of diseases like cholera, typhoid, hepatitis B, Human Immunodeficiency Virus (HIV) and Hepatitis C [7,8].

The infectious health care waste generated from our hospital was 0.341kg per day per bed. Baghotia had reported that the average quantum of waste generated in Delhi Government hospitals in Delhi is 260g per bed per day whereas it is 200g per bed per day in hospitals other than Delhi Government [9]. The health care waste produced in different health care units were found within limit (0.5-2 kg per bed per day) described in Central Pollution Control Board (CPCB) guideline [10]. Published studies from India reveal different quantum of waste generated for example studies conducted at SN Medical College, Lady Loyal Hospital and District Hospital, Agra revealed that the quantum of waste generated was 4.49, 0.12 and 4.2kg per bed per day [6]. Similarly in Puducherry primary and community health centres produce an average of 0.7kg per bed per day [11]. However, in developed countries due to increased use of disposables the waste produced has been upto 5.24kg. In hospitals of United Kingdoms, France, Norway, Spain, Netherlands, USA, Latin America and Iran waste produce is 3.3kg, 2.5kg, 3.9kg, 4.4 kg, 4.2kg, 4.5kg, 3.8kg and 4.45kg per bed per day respectively [12,13]. Due to the increased population and size of health care facilities, as well as the use of disposable medical products, health-care and medical wastes have sharply increased in recent decades [14]. The waste generated from our hospital was comparatively less, this may be due to less and judicious use of disposables because our hospital is in the peripheral area catering to more rural patients who visit a tertiary care charitable hospital like ours and belong to the middle and lower socio-economic status.

Looking at the individual category of waste generated per day, maximum quantum of waste generated from our hospital was infectious soiled waste collected in yellow bags (231.81Kg/day) followed by solid infectious waste (plastics) collected in red bag (30.93Kg/day) and sharp waste collected in white translucent puncture proof container (26.81Kg/day). Wastes generated in developing countries like India contain much less disposables and plastics than those generated in developed countries due to the cost factor. Increasing use of disposable in SN Medical College and District Hospital, Agra may be the reason of higher quantum of wastes generated [6]. The transportation, treatment and disposal of each category of waste in our hospital is as per the guidelines given by BMW management rule 1998 [2] and is outsourced to. Synergy Waste Management Pvt. Ltd., New Delhi, as per the MoU signed.

Recently, Government of India ministry of environment, forest and climate change, notification New Delhi, 28th March, 2016 [4] have published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-section: the BMW Management Rules, 2016. There are some changes highlighted in rule 2016 especially regarding management of chemical/liquid and sharp waste. However, the availability of resources needs to be worked out plus proper education of the HCPs in the areas of difference needs to be highlighted before implementing BMW rule 2016. Safe and effective management of BMW is our social responsibility and not just only a legal necessity. However, as per the BMW 2016, it needs to be implemented within 2 years of publication i.e. by 2018 by all health care facilities

LIMITATION

Our study had few limitation: i) the study design itself was an overview of management of infectious waste from the waste storage area and individual category of waste generated from different units in the hospitals was not looked for, therefore, to pinpoint the unit of the hospital from which maximum amount of infectious waste was generated is not possible. In future, properly designed study considering each category of infectious waste generated from each unit in the hospitals and laboratories will be carried out so as to pin point the unit of maximum generation; ii) Though the authors were aware of the BMW 2016 education, implementation and monitoring of the change could not be carried out and documented in the present paper.

CONCLUSION

There is a need for a policy change. In future, the new policy will be framed keeping the BMW 2016 in mind. The HCPs will be educated about the change in the policy and the same will be implemented after taking permission from the Hospital management Committee.

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