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Evaluation of Biomedical Waste Management in Multi-Speciality Hospital

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Abstract: 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. Poor waste management practices pose a huge risk to the health of the public, patients, professionals and contribute to environmental degradation. 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. So the present study was undertaken to assess knowledge and current practices of biomedical waste management including generation, collection, transportation, storage, in multi-specialty hospital The present study was an observational study and was carried out in multi-speciality hospital at Pune for the period of July 2015 to August 2017. The information regarding Bio-Medical Waste Management practices and safety was collected by way of semi-structured interview, 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. Total 113 participants were included in the study about biomedical waste management (50 bio waste handler,50 nursing staff, 10 laboratory technicians and 3 In-charge of biomedical waste management were the participants). We found knowledge regarding the coding system found better in nurses and technicians as compared to bio-waste handlers. Knowledge regarding the potential transmission of disease through biomedical waste was observed among only 27% of sanitary workers. Thus we conclude that all staff particularly paramedical need for training and reorientation training workshops on biomedical waste. Only one-third participants had high level knowledge, and more than 10% scored poor for practices. Knowledge regarding color coding and risks of handling biomedical waste was not adequate among the participants.
Keywords: health-care, waste management, training workshops.

INTRODUCTION

Hospitals are one of the complex institutions which are 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[2]. Poor waste management practices pose a huge risk to the health of the public, patients, professionals and contribute to environmental degradation. 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 [3].

According to "Biomedical Waste" (Management and Handling) Rules, 1998 of India BMW means "any waste which is generated during the diagnosis, treatment or immunization ofhuman- beings or animals or in research activities pertaining thereto or in the production or testing of biological and including categories mentioned in schedule-I[4]."

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, causingair 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 [2,3].

According to WHO (1998)[2] 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[3,4]. Keeping this in view, bio-medical waste management at this tertiary care multi-speciality hospital set up was studied. The present study was undertaken to assess knowledge and current practices of biomedical waste management including generation, collection, transportation, storage, in multi-specialty hospital.

MATERIALS AND METHODS

The present study was an observational study and was carried out in multi speciality hospital at Pimpri, Pune with an aim to evaluate biomedical waste management. Institute Ethics Committee clearance was obtained before the start of study.

Study type: Observational study

Duration of study:
July 2015 to August 2017

Sample size
113

Place of study
Multi-speciality hospital Pimpri, Pune

DATA COLLECTION

- The information / data regarding Bio-Medical Waste Management practices and safety was collected by way of semi-structured interview, with the house-keeping in-charge of the hospital after obtaining inform consent **.** Proforma being the one used for biomedical Waste management questionnaire and awareness of healthcare providers regarding hospital waste management questionnaire form

- 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.

RESULTS

The present study was carried out in the Department of Community Medicine in one of the major tertiary institute during July 2015 to August 2017 in Pune city of Maharashtra. Total 113 participants were included in the study about biomedical waste management (50 bio waste handler,50 nursing staff, 10 laboratory technicians and 3 In-charge of biomedical waste management were the participants). In our study youngest participant was of 20 years and oldest was of 54 year old female handler.

They were provided different questionnaire as per nature of job in the hospital and immunization status was evaluated. All participants were given special training like handling of bio waste, colour coding, government regulations and proper disposal. The data was well tabulated in the prescribed format and following observations were made as shown in table1,2,3,4,5,6 :

Table-1: Distribution of participants according to their nature of job

Participants	No.	Percentage (%)
In-charge of BMW management	03	02.7
Nurses	50	44.2
Laboratory technicians	10	08.9
Ward boy/Aaya (Handler)	50	44.2
Total	113	100

Table-2: Record of biomedical waste generated/per day in kg in various department of hospital

Sr. No.	Department	Black Bag	Yellow Bag	Red Bag	Blue Bag
1	T.B. Chest	56	03	02	06
2	Gynec Ward	22	06	01	10
3	Gynec OT/Labour Room	12	27	10	02
4	Ortho Ward	52	20	11	10
5	Surgery	50	38	25	20
6	Pediatric Ward	45	10	14	08
7	NICU/PICU	10	06	05	05
8	Cardic/Cath Lab	30	12	32	16
9	Medical Ward	52	04	08	05
10	ICU	65	36	22	20
11	OT	60	25	18	14
12	Central Lab	26	10	10	08
13	OPDs	25	11	06	06
14	Blood Bank	24	13	03	02
15	Others	205	24	10	07
16	Total	1404 Day			

Others-various clinical (Ophthalmology, Skin & VD, ENT) and nonclinical departments

Table-3: Questionnaire of In-charge BMW and their responses

Sr. No.	Question	Y/N	Observation
1	Waste segregation information is prominently displayed near or on the waste bins?	Yes	Yes
2	Staff(due for training) has attended a training session on correct & safe disposal of clinical waste?	Yes	Register No
3	Is the dedicated area (Central Storage Area) for the safe storage of biomedical waste (inside compound) locked & inaccessible to animals & public?	Yes	Observe No
4	Is the dedicated area (Central Storage Area) a safe, ventilated and secured location for storage of segregated biomedical waste in coloured bags or containers in the manner as specified in Schedule I, to ensure that there shall be no secondary handling, pilferage of recyclables or inadvertent scattering or spillage by animals?	Yes	Observe No
5	Is the bio-medical waste from such place or premises directly transported in the manner as prescribed in these rules to the common bio-medical waste treatment facility or for the appropriate treatment and disposal, as the case may be, in the manner as prescribed in Schedule I?	Yes	Observe No
6	Is the waste compound kept clean & tidy and pest free?	Yes	Observe Yes
7	Has the Pre-treatment of Microbiology, Biotechnology and other clinical laboratory waste been done on-site?	No	Observe No
8	Is the BMW Register maintained & updated on a day to day basis?	Yes	Register Yes
9	Has the BMW been collected by the Vendor on each day (as agreed in the terms & conditions with the vendor) including holiday?	Yes	Register Yes
10	Is the list of vehicles authorized to collect BMW prominently displayed at the Central storage area & available at security gate?	Yes	Observe Yes
11	Has the Chemical Liquid Waste been pre-treated in the on-site Effluent/Sewage treatment Plant before discharge?	No	Observe No
12	Has BMW management been discussed in the Infection Control Committee Meeting and minutes recorded (if the meeting was scheduled to be held in the previous month as per the prescribed frequency)?	No	Register No
13	Has Health Check-up been done for all new joinees (Health care workers) who joined during the previous month?	Yes	Register Yes
14	Has Immunization been done for all Health care Workers due for the same during the previous month?	Yes	Register No
15	In case of a major accident has the same been reported along with the remedial actions	Yes	Register

	within 24 hrs to the appropriate authority?		Yes

Table-4: Knowledge Regarding BMW in Nursing Staff and their responses (n=50)

Sr.No.	Question	Yes (%)	No (%)
1	Have you attended a training session on correct & safe disposal of clinical waste?	49 (98%)	01 (2%)
2	Are you aware about different category of biomedical waste?	50 (100%)	Nil
3	Do you know different color coding bags used for biomedical waste?	50 (100%)	Nil
4	Are waste bags removed from clinical areas daily?	49 (98%)	01 (2%)
5	Are you aware of government regulations and legislation related to biomedical Waste management of 2016?	Nil	50 (100%)
6	Do you know how inadequate biomedical waste management contributes to environmental pollution and global warming?	28 (56%)	22 (44%)
7	Are you aware about symbol used to denote biomedical waste?	41 (82%)	09 (18%)
8	Your opinion whether biomedical waste management programme should be made a part of the academic curriculum?	40 (80%)	10 (29%)
9	Have you done a health check-up before joining this job?	17 (34%)	33 (66%)
10	Have you done a health check-up after joining this job?	43 (86%)	07 (14%)

Table-5: Knowledge Regarding BMW in Laboratory Technicians (n=10)

Sr.No.	Question	Yes (%)	No (%)
1	Have you attended a training session on correct & safe disposal of clinical waste?	09 (90%)	01 (02%)
2	Are you aware about different category of biomedical waste?	10 (100%)	Nil
3	Do you know different color coding bags used for biomedical waste?	10 (100%)	Nil
4	Are waste bags removed from clinical areas daily?	10 (100%)	Nil
5	Are you aware of government regulations and legislation related to biomedical Waste management of 2016?	07 (70%)	03 (30%)
6	Do you know how inadequate biomedical waste management contributes to environmental pollution and global warming?	10 (100%)	Nil
7	Are you aware about symbol used to denotes biomedical waste?	10 (100%)	Nil
8	Your opinion whether biomedical waste management programme should be made a part of the academic curriculum?	10 (100%)	Nil
9	Have you done a health check-up before joining this job?	04 (40%)	06 (60%)
10	Have you done a health check-up after joining this job?	09 (90%)	01 (10%)

Table-6: Knowledge Regarding BMW in Handler (n=50)

Sr. No.	Question	Yes(%)	No (%)
1	Are you aware of the waste segregation procedures?	30 (60%)	20 (40%)
2	Do you know the hazards associated with poor health care waste management?	03(6%)	47 (94%)
3	Do you know the hazards associated with poor health care waste management?	14 (28%)	36 (72%)
4	Are you aware of colour codes and type of containers used for disposal of biomedical waste?	04(8%)	46 (92%)
5.	Have you used adequate personal protective equipment – Gloves	38(76%)	12(24%)
	Apron	28(56%)	22(44%)
	Boots	08(16%)	42(84%)
	Face Mask	13(26%)	37(74%)
	Eye goggles	Nil	50(100%)
6.	Do you removed waste bags from clinical areas daily?	25(50%)	25(50%)
7.	Do you empty clinical waste from one bag to another?	Nil	50(100%)
8.	Do you seal/tie bags securely during transportation?	25(50%)	25(50%)
9.	Do you use separate closed trolley for waste transportation?	Nil	50(100%)
10.	Do you use utility lift for waste transportation?(If available)	Nil	50(100%)
11.	Is the dedicated area for the safe storage of biomedical waste locked and inaccessible to animals and public?	Nil	50(100%)
12.	Received special training in bio-medical waste handling	23(46%)	27(54%)

DISCUSSION

Biomedical wastes among the solid wastes is the most dangerous type of waste because of being contaminated with disease carrying pathogens therefore needs safe disposal. Biomedical waste refers to any wastes i.e. solid or liquid including the container and any immediate product generated during diagnosis, treatment or immunization of human beings or during research involving testing of organisms. It includes wastes like syringes, vaccines, laboratory samples, solid wastes, disposables, anatomical wastes, cultures, discarded medicines, chemical wastes etc[5].

Hospital wastes are categorized as general non hazardous, pathological, radioactive, chemicals, pharmaceuticals and infectious wastes [6]. Therefore it is imperative to mention that if these are not handled and disposed properly, can transmit and spread number of deadly diseases [7]. As per WHOM [2], every year more than 5000 people die from increasing infectious diseases. Keeping in view these facts, present study has been undertaken.

The study was conducted in Pune city in a major tertiary center hospital which included 113 participants of both male and females (50 nurses, 10 laboratory technicians, 50 bio-waste handlers and 3 in-charge of biomedical waste management (BMW). Different questionnaire were given to the participants and according to the conclusions of questionnaire our study found that around that nurses 50 (44.2%), laboratory technicians 10 (8.9%), bio-waste handlers 50 (44.2%) and all 3 In-charge of BMW were aware about the different colour coded bags for disposal of BMW. In our study we found knowledge regarding the coding system found better in nurses and technicians as compared to bio-waste handlers.

Similar study was carried out in Allahabad city hospital by Mathur *et al*. [8] who showed 60 participants were nurses, 78 laboratory technicians and 70 sanitary staff. Study showed that knowledge regarding the colour coding was found to be better among nurses and laboratory technicians. Knowledge regarding the potential transmission of disease through biomedical waste was observed among only 27% of sanitary workers which is similar to our study. Same observation were also made in the study carried out by Balamurugan *et al*. [8,4].

One of the major study at Madhya Pradesh showed 95% of paramedical staff were aware of hazards associated with bio-medical waste while only 43% of non-medical staff (Handlers) were aware of that, colour coding was known to 44% of paramedical staffs and 6% of non-medicals, 43% of paramedical staff and 7% of non-medical staff were aware that biomedical waste can be stored for maximum of 48 hours[8,5]Similar observations were found by various studies in India[10-12].

In our study, bio-waste collection was carried out within 24 hours of its generation as the annual contract was given to PASSCO Environment Solution Pvt Ltd, a service providing company, runs this facility on behalf of the Pune Municipal Corporation.

Chauhan and Malviya [13] analyzed solid waste management practices in sixteen hospital of Indore city and found hospital authorities think that their basic responsibility to take care of the health of patients whereas the waste disposal in an environmentally compatible manner has been given a low priority.

Shalini *et al.* [14] found, 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 because of poor segregation practices followed. Similar findings were seen by Chauhan and Sharma that 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. Nema and Prasad [15] observed that except for a few hospitals, waste is mostly dumped in the open space enabling rag pickers to collect syringes, cotton, plastics. In many hospitals, medical waste is burnt at dumpsites in an open environment.

In the present study measures adopted by the waste handlers was very poor, i.e. 76% using gloves (38/50) and 56% using aprons only. Face masks, eye-shields, boots were worn very less by handlers while handling the biomedical waste. According to Henry *et al*. the safety measures adopted by the waste handlers was very poor, with only 30% using gloves and 11% masks while handling the waste. Eyeshields, aprons, long boots were worn by none. The observations of our study are in accordance with that of Henry *et al*. [16] and Shalini *et al*. [15].

Kumar *et al*. [17] in their descriptive study on evaluation of bio-medical waste management in tertiary care hospital of North India showed segregation of waste is the most crucial step for proper management of BMW as waste segregated into various colour coded containers is finally taken to different sites for disposal. Presence of a wrong kind of waste in particular container will obviously nullify the efforts of appropriate disposal of waste. Proper segregation of waste, the waste bins in appropriate number at appropriate places and with appropriate colour code are required to be placed at the source of generation of waste. Present study implies that the basic infrastructure for proper segregation of waste at the source of generation of waste was well placed in hospital. However, it was found that almost all waste receptacles were open i.e. without any lid over them.

Waste receptacles should preferable is cover ones having foot-operated lids and so it is desirable to gradually replace the existing open type waste receptacles with the ones having foot-operated lids [2]. In a study in 1800 bedded tertiary care hospital in Mumbai, it was found that waste segregation was less than satisfactory in 40.3% of areas in spite of continuous monitoring and informed counselling of health care workers Nataraj [18].

Present study was carried out in 1,450 bedded private tertiary hospitals and it generates 0.96 kg of BMW waste per patient per day. One previous study at MLB Medical College and Hospital, Allahabad (UP) generates 0.52 kg/day during March 2009 to May 2009. They pointed out that maximum waste was generated in wards. However, the figure of BMW kg/bed/day was comparatively less than as suggested by previous studies which suggest that most hospitals generate 1-2 kg/day[15]. According to Tiwari *et al*.[19]. In India generate 1-2 kg/bed/day except AIIMS and SKIMS, which produce waste on higher side. According to Balamurugan *et al*.[9] approximately 1.45 kg waste is generated per patient per day in Indian hospitals it is as high as 4.5 kg in developed countries. As per western figures 15-20% of this total waste is hazardous, whereas, it would be much higher in India because proper waste segregation and waste disposal methods either does not exist or not practiced [20,21].

CONCLUSION

Thus we conclude that all staff particularly paramedical need for training and reorientation training workshops on biomedical waste. Only one-third participants had high level knowledge, and more than 10% scored poor for practices. Knowledge regarding color coding and risks of handling biomedical waste was not adequate among the participants. Nursing protocol should be made for handling infectious and noninfectious waste should by displayed at all nursing stations.

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