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Study on Biomedical Waste Management Knowledge among Healthcare Workers

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Abstract

Biomedical waste if not handled properly can pollute the environment and can spread many harmful diseases. Health care workers in our country are still not fully aware about proper BMW handling and disposal, despite increasing global awareness on it. The objective of the study was to understand the level of knowledge, awareness and practices (KAP) regarding BMW handling and disposal among health care professionals in institutions. This was a cross-sectional study and conducted in 5 different hospitals (Bed capacity >250) in metro cities. The study was conducted in 3 months. A total of 300 hospital staff from different hospitals responded as participants and further data analysed were consented to fill a structured valid questionnaire on biomedical waste management in hospitals. These respondents were asked to be filled either questionnaire on Microsoft form from their computer or on hardcopy. The structures valid questionnaire was prepared on Microsoft office forms and 100% response rate was received from the staff working in different areas including wards, ICU, laboratory and OPD of the hospital. Those who were willing to submitted hard copies, 30 minutes time was given to each participant to finish the questionnaire and finally submit the form, the results were entered into Microsoft office form and analysed.

The questionnaire was developed based on an extensive literature which can include knowledge, attitude and practice (KAP) with regards to biomedical waste management adequately. The questionnaire was given after designed and a pretested questionnaire and checklist was conducted on 10 staff. All questions were closed ended questions. The questionnaire was divided into 4 sessions i.e., Session -1 for personnel data, Session -2 to know knowledge assessment, Session -3 on Attitude assessment and Section -4 on practice Questionnaire. The data forms were collected and underwent scrutiny for logical inconsistencies, skip patterns, and missing values. Results were expressed in numbers and percentages. Conclusion: Most of the healthcare workers are aware about the biomedical waste management rule and its requirements but required regular training for colour coding and how to segregate and store the waste.

Keywords: BMW; Biomedical waste management in hospitals; Waste Management; Knowledge among hospital staff; Universal precautions; Biohazard; Biomedical waste management rule; KAP among Healthcare; Sanitation; Healthcare workers

Introduction

The amount of biomedical waste being generated in our country is increasing day by day. The Healthcare industry in India is delivered mainly either by public or private providers. The healthcare industry in India comprises of Hospitals, medical centres, clinical trials, telemedicine, clinics, medical tourism, and health insurance. The public healthcare focuses on delivering primary healthcare through community-level health programmes mainly focusing on reducing mortality and morbidity caused by various communicable and non-communicable diseases. It follows a tiered system of infrastructure wherein basic health services are provided through sub-centers and primary health centers, while secondary and tertiary care is delivered at better equipped establishments such as community health centers, district hospitals and medical colleges that are mostly at district headquarters. Statista stated that the healthcare industry is growing at a tremendous pace to reach $372 Billion by 2022 from $ 45.0 billion in 2008 owing to its strengthening coverage, services and increasing expenditure by public as well as private players [1]. In terms of employment and revenue, healthcare has been one of the largest sectors and is growing at a vigorous pace.

According to Government of India's Biomedical Waste (Management and Handling) Rules , the term "Biomedical waste" (BMW) has been defined as "any waste that is generated during diagnosis, treatment or immunization of human beings or animals,

or in the research activities pertaining there to or in the production or testing of biologicals". Waste management is a sensitive issue all around the world [2]. Biomedical waste (BMW) is any waste produced during the diagnosis, treatment, or immunization of human or animal research activities pertaining thereto or in the production or testing of biological or in health camps. The basic principle of good BMW practice is based on the concept of 3 Rs, namely reduce, recycle and reuse. It follows the cradle to grave approach which is characterization, quantification, segregation, storage, transport, and treatment of BMW. Chartier argue that the best BMW management (BMWM) methods aim at avoiding generation of waste or recovering as much as waste as possible, rather than disposing [3]. Therefore, the various methods of BMW disposal, according to their desirability, are prevented, reduce, reuse, recycle, recover, treat, and lastly dispose. Hence, the waste should be tackled at source rather than "end of pipe approach." Yves state that this waste is comprised of two different categories, namely

hazardous and non-hazardous waste [4]. According to World Health Organization (WHO), 75% to 90% of healthcare-related waste is non-hazardous, while the remaining percentage is considered as hazardous. Patil argue that poor management of HCW exposes health-care workers, waste handlers and the community to infections, toxic effects and injuries [5]. On an average, the hospital waste generation rate ranges from 0.5 to 2.0 kg/bed/day which amounts to about 0.33 million tons annually. The magnitude of waste generation is continually rising with the use of advanced technological practices and patient safety concerns, disposable medical equipment. However, the use of advanced technological practices and safety concerns, disposable equipment is more commonly used in developed countries, thus resulting in them generating more waste than developing countries. Poor knowledge of hospital waste management can result in serious environmental and human health risks. The absence of waste management training programmes roots ignorance among staff and handlers, which leads to unsafe waste handling and causes different health risks and environmental damage.

The first edition of WHO handbook on safe management of wastes from health-care activities known as "The Blue Book" came out in 1999. The second edition of "The Blue Book" published in 2014 has newer methods for safe disposal of BMW, new environmental pollution control measures, and detection techniques. Statista stated that in addition, new topics such as health-care waste management in emergencies, emerging pandemics, drug-resistant bacteria, and climate changes were covered in the second edition. The most common problems associated with the healthcare workers with biomedical waste management handling is lack of awareness about segregation, health hazards, insufficient financial allocation and manpower for proper management. They need well updated information about rule and skill and practices in managing this waste besides reducing hospital acquired infections to protect their own health. The innovative ideas need to be implemented for help healthcare workers in developing knowledge and skill example similar colour coding of waste bins and plastic bag used, poster presentation above each bin, colour code in waste storage rooms, etc.

Objectives of the study

To determine the awareness regarding BMW management policy among hospital Staff.

To assess their attitude and practice (KAP) towards management of BMW.

Methodology

This was a cross-sectional study was conducted in 5 different hospitals (Bed capacity >100) in metro cities. The study was conducted in 3 months, January 2023 to March of 2023. The study was carried out using two approaches, namely 1) A literature search and review and 2) a survey questionnaire. The literature search and review were carries out through multiple means, including reading books, internet search and email correspondence.

Study participants included only healthcare workers including Doctors & Consultants (44), Administrative (Executives, Quality, Managers, etc.) (118), Nursing (224), Technician /Para-Medical (58), Housekeeping (102), Security/Food & Beverages/ Maintenance (38), others (16) personnel working in different departments of the hospitals. A total of 600 participants consented to fill a structured valid questionnaire on biomedical waste management in hospitals. The questionnaire was forwarded or given to the potential participants who have the requisite knowledge of the status of Biomedical waste

management includes hospital administrators, executives, paramedical staff, nursing, technicians and housekeeping staff only. The structures valid questionnaire was prepared on online Microsoft office forms tool and 100% response rate was received from the staff working in different areas including wards, ICU, laboratory and OPD of the Hospital. These respondents were asked to be filled either questionnaire on Microsoft form online (link of the form was forwarded to their email ID) or through hardcopy. 30 Minutes time was given each participant to finish the questionnaire and finally submit the form, the results of hard copy received were entered into Microsoft office form and analysed.

The questionnaire was developed based on an extensive literature which can include knowledge, attitude and practice with regards to biomedical waste management adequately. The questionnaire was given after designed and a pretested questionnaire and checklist was conducted on 10 staff. All questions are closed questions. The questionnaire consist of 4 sessions i.e. Session -1 for personnel data, Session -2 to know knowledge assessment, Session -3 on Attitude assessment and Section -4 on Practice Questionnaire.

Results and Discussion

Total participants are 600, where males are 344 (57.33%) and female 256 (42.6%), Average experience in hospital (around 4 years). Positive answer was assessed among all groups and questionnaire gave by participants were tabulated in tables (Table 1).

From total participants 44 (7.33%) were doctors and consultants, while 224(37.33%) were in highest number who responded with complete information. Mostly in hospitals nurses, housekeeping and doctors play a major role in KAP of biomedical waste management.

Section 2: Knowledge among groups about BMW

(Table 2)

522(87%) participants received training on how to handle and know about the bio medical waste management rule. 291 (97%) responded that they know the colour coding and segregation of BMW. Majority of the respondent were aware about the sharp handling and bio-hazardous waste, which help them to save from needle stick injury and any other accident.

Attitude assessment among groups about BMW

Section-3 -Attitude assessment

(Table 3)

Section -4 - Practice questionnaire

(Table 4)

Segregation of waste is one of the most crucial phases of waste management various studies in Asian developing countries have reported that there is a lack of proper practice in segregation and the implementation of standards, allowing it to vary from place to place.

Table 1: Response towards KAP of bio medical waste management.

Participants	No.
Consultant / Doctors	44 (7.33%)
Administration	118 (19.67%)
Nurses	224 (37.33%)
Technician / Para- Medical	58 (9.67%)
Housekeeping	102 (17.00%)
Security/ Food & Beverages/ Maintenance	38 (6.33%)
Other	16 (2.67%)

Table 2: Knowledge questionnaire.

Knowledge Question	Yes	No	Not Known
Do you have received any training for BMW management	522 (87%)	78 (13%)	0(0%)
Do you know about Bio Medical Waste generation and legislation (Rule)	522 (87%)	62% (10.33%)	12 (2%)
BMW rules apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio medical waste in any form?	540 (90%)	26 (4.33%)	32 (5.33%)
Do you know about colour-coding segregation of Bio-Medical Waste Management?	291 (97%)	12 (2%)	4 (0.67%)
Bio-hazardous sharps containers must be rigid, leak resistant and puncture proof	574 (95.67%)	12 (2.00%)	12 (2.00%)
Bio-hazardous waste container/ bag must have the "Bio-hazardous Waste" symbol visible and legible on the container.	558 (93.00%)	6 (1%)	34 (5.67%)

Table 3: Attitude assessment among groups about BMW.

Bio Medical Waste Management is	Agree	Disagree	Not Known
Only Housekeeping staffs are responsible for safe management of biomedical Waste	24.70%	73.00%	2.30%
Waste management is team work/not a single class of people?	86.00%	12.00%	2.00%
Increases financial burden	39.00%	50.30%	10.70%
Its adds extra burden of work	30.70%	62.00%	7.30%
Safely management of hospital waste is not an important issue at all	24.00%	73.70%	2.30%
Presence of legal policies help in safe management of BMW	90.70%	5.00%	4.30%
Segregations is the most important step in BMW Management	94.70%	1.70%	3.70%
Colour – Coding helps in segregation & transportation of waste	97.00%	2.00%	1.00%
Training orientation towards BMW is necessary	95.30%	2.70%	2.00%
Accident reporting of health care personnel while handling waste helps in safety	92.70%	4.30%	3.00%
Contaminated waste should not be stored for more than 24 hrs	87.00%	8.00%	5.00%
Mismanagement of Biomedical waste has the potential to spread disease like Hepatitis, HIV and	95.70%	3.30%	1.00%
Best way of disinfecting infectious waste is by chemical disinfection	76.30%	11.70%	12.00%

Table 4: Practice questionnaire among all groups.

Please Mark what you are following in your hospital	Yes	No	Not Known
Use of Protective clothing for BMW waste collector	95.70%	2.30%	2.00%
Apron	73.30%	23.70%	3.00%
Boots	69.70%	26.30%	4.00%
Mask	97.00%	2.00%	1.00%
Goggles	73.30%	22.70%	4.00%
Gloves	98.00%	1.30%	70.00%
Whether required proper colour coded storage facility for collecting BMW at work place?	97.30%	1.30%	1.30%
Provided with hub cutter for needles and syringes	92.30%	4.70%	3.00%
Reporting needle-stick injuries to concern Authorities	88.00%	5.30%	6.70%
Maintaining record for any injuries related to BMW	68.70%	11.30%	20.00%
Do you re-cap the used needle?	19.30%	77.70%	3.00%
Staffs are Vaccinated against hepatitis-B, Tetanus	96.70%	2.30%	1.00%
Doing Periodically medical examination for all health care personnel	92.30%	5.00%	2.70%
Know the place where BMW treated	80.00%	16.30%	3.70%
Visiting and auditing place where BMW treated	53.70%	43.70%	2.70%
Doing Bar Coding of all waste	77.70%	9.70%	12.70%

The absence of waste segregation might result in an increased quantity of infectious waste that harnesses the potential to turn general waste into the hazardous waste. (13) These issues are mostly caused by the lack of funds, awareness, ignorance of handling staff, and somewhat owing to lack of maintaining records (Table 5).

Storage facilities should also be sanitised on a regular basis, and a suitable temperature is to be maintained permanently. Storage duration should be as low as possible, and the location must have adequate bio-hazard warning signs to avoid accidents. Proper ventilation with a sufficient water supply and proper sewerage system should always be accessible.

Gupta inform that the ultimate goal of waste treatment is to turn the waste into harmless material through reducing its volume, infection risk, and the disposal of organic compounds [6]. Waste disposal is an essential part of waste management and developed countries around the world have been observed to use different methods for waste disposal, some of which are very high-tech and expensive.

This study has undertaken mainly to assess the awareness about various aspects and categories of bio medical waste management like knowledge, attitude and practices of disposal. Majority of doctors, residents, staff nurses are aware of bio medical waste management and its dire consequences resulted by improper disposal. Nursing staff is mostly generate the maximum biomedical waste at bed side and clinical treatment area, so segregation is most important factor while housekeeping mostly manages the work of the activities related with biomedical waste management. Nurses and housekeeping are working heavily in various high-pressure departments such as operation theatres, emergency, ICU's. They have to work deliberately in wards, where there will be much work and mostly less staff. Housekeeping is the

Table 5: Segregation of waste.

Category of colour coded waste bin that are used to dispose Biomedical waste :				
Category of Waste	Red coloured Non-chlorinated plastic bags or containers	Yellow coloured Non-chlorinated plastic bags or containers	Blue Coloured Boxes	White Puncture proof, Leak-proof, tamper-proof containers
Anatomical Waste (Human Anatomical waste - body parts, human tissue)	6.30%	92.70%	0.30%	0.00%
Needles, syringes with fixed needles, scalpels, blades	9.70%	4.70%	4.70%	80.00%
Placenta	8.00%	90.00%	1.00%	0.30%
Medicine/ Pills or Expiry Medicines	8.00%	66.00%	3.00%	6.30%
Glassware -Broken or discarded and contaminated glass	5.30%	2.30%	80.70%	11.00%
Urine bags, Plastic IV bottles, IV sets, Gloves	86.70%	8.00%	2.30%	0.00%
Cytotoxic waste medicine with Label on Bin	7.70%	80.70%	1.30%	1.30%

backbone for biomedical waste management, they have to collect also segregate, transport and store at bio medical waste room. In the present study most of the healthcare worker answers all aspects of knowledge questionnaire, attitude and practice questions, they are aware about the rules but only require is attitude and practice on ward level. Rekha Sachan argues that many of the studies reported that healthcare personnel have knowledge regarding BMW management but it has not put being practiced [7]. Few literatures mentioned that knowledge of BMW management among students is not appropriate. Ehrampoush that correlation exist between activities of BMW management and subjects' knowledge [8]. It is very important to improve the skills, attitude of Bio medical waste management and encourage staff to put into practice.

Conclusion

There are two categories of staff who have maximum workers strength in any of the healthcare are nurses and housekeeping so there should be a continuous training programme for all health personnel with special focus on housekeeping staff, paramedical Staff with amendments made in biomedical waste management rule. Biomedical waste management rules should be strictly implemented at all levels. The pillar of biomedical waste practices followed by segregation of waste at source, good BMW practices followed by both health-care workers and HCFs, continuous monitoring of BMW practices, and strong legislature. It is important that regular clinical round and monitoring are needed on each level to increase the awareness and change the attitude to manage Bio medical waste in near future.

Limitations

This study has been limited to healthcare management workers in India and focused only on the KAP. Waste management technologies and their impact have not been deeply discussed.

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