

KAP study on bio-medical waste management among nursing professionals in Haldwani (Nainital)

Amit Dumka¹, Dr. Preeti Khanduri²

¹Dy. Manager (Extension & Training), Government Medical College, Haldwani, Uttarakhand-263139, INDIA

² Department of Botany, Dr.P.D.B.H.Govt. P.G. College, Kotdwara, Uttarakhand, INDIA

Abstract

Background: Biomedical Waste (BMW) is the waste generated from medical and health activities or related activities. Nursing is a profession within the health care sector focused on the care of individuals, families, and communities so they may attain, maintain, or recover optimal health and quality of life. Nurses are the backbone of the healthcare setup and they should be conscious about safe disposal and segregation practices. So, the present study has been undertaken to assess the knowledge and awareness about biomedical waste management among them. The aims and objectives of the study are to assess the knowledge and awareness about biomedical waste management in nursing professionals of different institutions from a tertiary care hospital to nursing colleges.

Methods: In this cross-sectional study 205 nursing professionals of different institutions were interviewed. A pretested self-administered questionnaire on BMW management was given to the nursing professionals. The questionnaire was sent using google forms.

Results: Out of 205 nursing professionals 198 (96.59%) were aware of the biomedical waste management & Handling rules, 1998. 55 (27%) participants had undergone training but 185 (90%) feel that regular training programme should be conducted. 94 (46%) had knowledge about segregation at sources of generation of BMW and 160 (78%) had knowledge of Biohazard symbol. Only 98 (48%) had knowledge of maximum time limits for storage of waste but 28% (57) answered that record maintenance was essential for biomedical waste management. 88% (180) said that BMW is teamwork. Only 25% (51) are aware about the

importance of labeling of biomedical waste bags.

Conclusions: There is a need for rigorous training programme for interns and monitoring is needed.

Keywords: *Biomedical waste management, training, Nursing Professionals, Nursing Staff*

1. Introduction

It has been observed that during the last few years medical science has attained many advances. There are procedures or illnesses which were once untreated and no one can think of any hope of treatment or development of technology to cure are either available or research is going on which a hope to get result is coming time period. With these advances in medical & health science, these developments are also creating threats to the eco-system or biomass on the planet. The major threat is the waste management resulting from these health care facilities. Bio-Medical Waste management and handling become a viral issue of these days and also the demand of the community and their well-being. The term Bio-Medical Waste (Bio-Medical Waste) means any waste generated during the diagnosis treatment or immunization of human being or animals or in research activities pertaining thereto in the production or testing of biological, including categories as mentioned in the schedule-I of Bio-Medical Waste Management and handling rules, 1998 as amended thereafter time to time.

According to various studies, it has been approximated that 75-90% of the waste produced by the health care facility is non-hazardous and remaining 10-25% is of hazardous in nature and carries a high potential for infections and injury. Inadequate, inappropriate and poor handling and management of Bio-Medical Waste can have serious health and environmental consequences. It is also a

major factor for increase in cases related to hospital acquired infections among health care providers. In this regard WHO statistics state that more than 8 million hepatitis B, over 2-3 million hepatitis and more than 8000 cases of HIV, are estimated as to over yearly from the reuse of syringe and needles with sterilization. Various studies have shown that safe and effective management of Bio-Medical Waste is legal necessity along with social responsibilities.

In India approximately 3 million tonnes of Bio-Medical Waste is generated annually and is expected to grow at 8-10% annually. Inadequate knowledge or less awareness level among different categories of staff in the health care facilities has led to the failure of Bio-Medical Waste management. Segregations, collection and disposal of Bio-Medical Waste in a health care facility is actually significant area of concern for health care personnel and community at large. As per the Bio-Medical Waste Management & handling rules, 1998 each and every concern health care personal should have appropriate knowledge, practice regarding the waste segregation, collection, & disposal.

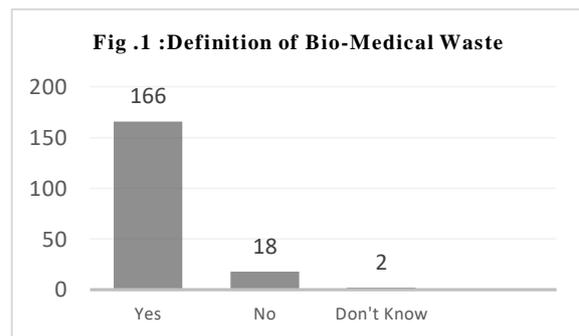
Nursing personals, who plays as important role in handling & management of the Bio-Medical Waste, are exposed to various infectious fluids and hazardous while providing the nursing care in the health care facilities. They are the very important pillars of waste management protocol chain of health care facilities. It is very important that these professionals should be well aware of safe and effective management & handling of Bio-medical Waste. For the successful systems of Bio-Medical Waste management knowledge of various steps of waste management is very important, because lack of this knowledge may result in occupational hazards for all health care professionals working the health care facility. Hence this study was done on the nursing professionals working in various health care facilities, nursing college and medical college in the Haldwani using questionnaire based cross sectional study to determine the current status of knowledge, attitude and practice regarding Bio-Medical Waste according the future course of action can be identified for the proper & effective management of bio-medical waste.

The study comparison of assessment of Knowledge, Attitude and Practice (KAP) regarding Bio-Medical Waste amongst nursing professionals in Haldwani. A total 205 nursing professionals in Haldwani city participated in the study. To gain the knowledge of various collection & disposal mode of Bio-Medical Waste management adopted in various health care facilities of Haldwani a survey was done. Thereafter structured questions were used to obtain primary data from nursing professionals working in various health care facilities or teaching institutions using online tool from Goggle Forms by sending the

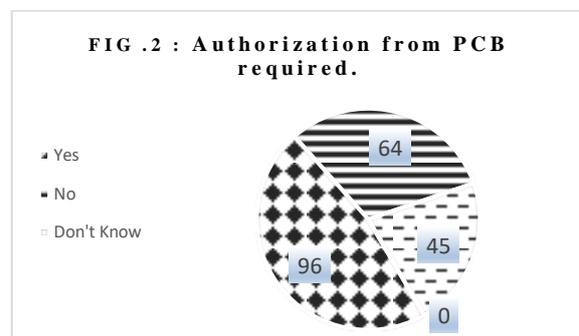
questionnaire URL to the participant's e-mail. The information was obtained from the respondent through a pre-designed self-administered questionnaire. The questionnaire consists of knowledge, attitude and practices, regarding Bio-Medical Waste management and handling based on Bio-Medical Waste (Management & Handling) Rules 1998. Though the rules have been revised in 2016 but these revised regulations are yet to be implemented in many facilities as the period of study was before the implementations of 2016 amendments. Hence, the analysis of the responses was carried out with respect to the Bio-Medical Waste (M&H) rules 1998.

3. Observations

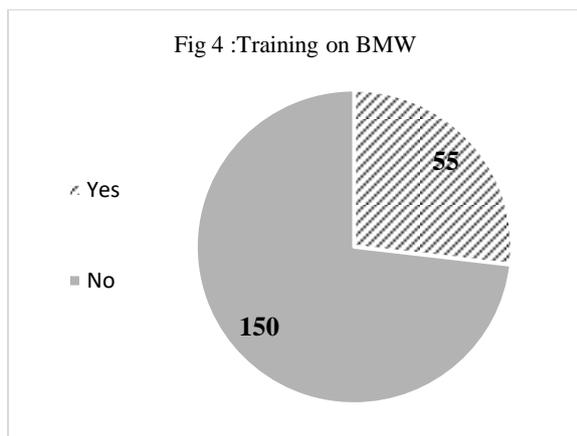
Among 205 nursing professionals, these uses 185 female and 20 males. 81% (n=166) nurses were aware of the correct definitions of Bio-Medical Waste. 97% (n=199) were aware of the fact that Bio-Medical Waste is generated during & treatment of disease.



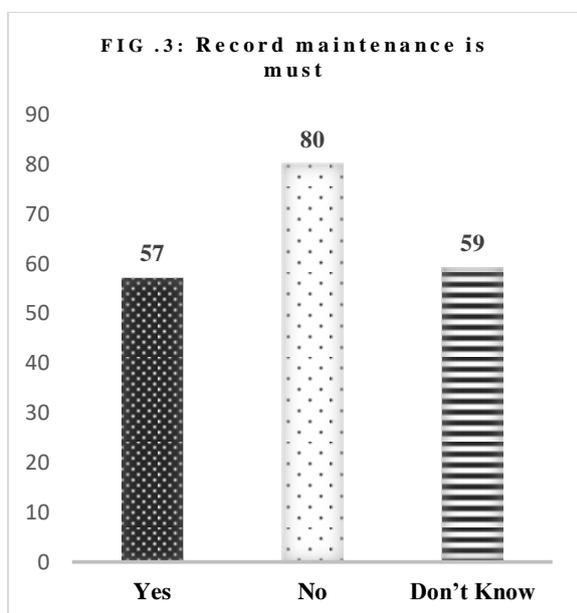
47% (n=96) nursing professionals were aware that an authorization is required for Bio-Medical Waste management from pollution control board.



Only 27% (n=55) of the nursing professionals had undergone any training/education of Bio-Medical Waste management. Hospitals and nursing homes are the major source of generation of bio-medicals waste in accepted by 96.59% (n=198) respondents whereas 3.41% (n=7) think there are other sources too.



97.56%(n=200) had knowledge of different colours for segregation of different categories of waste as per the code namely yellow, blue, red and black and 2.44% (n=5) do not know about this. According to the data available it was found that 87.32% (n=179) states there are 03 categories of Bio-Medical Waste whereas 10.24% (n=21) do not agree with this and 2.44 (n=5) do not have knowledge about this. 81%(n=166) know about source of generation of Bio-Medical Waste and 78%(n=160) had knowledge of bio hazard symbol. 46% (n=94) had knowledge that most important aspect of Bio-Medical Waste Management is segregation. 28% (n=57) said that record maintenance in essential for Bio-Medical Waste generation & disposal at the generation site.



In our study, 67.46 %(n=) nursing professionals know that waste minimization is one important step in Bio-Medical Waste management.

Table 1: Questions and the responses marked by the participants (in %) on Knowledge of Bio-Medical Waste (Figures in the parenthesis indicates number of respondents)

Sl.	Questions	Yes	No	Don't Know
Knowledge				
1	Have you undergone any training programme on Bio-Medical Waste	27% (n=55)	73% (n=150)	0
2	Are you aware of Bio-Medical Waste (Management & Handling) Rules 1998	75% (n=154)	25% (n=51)	0
3	Are you aware of the Bio-Medical Waste's Definitions	81% (n=166)	9% (n=18)	1% (n=2)
4	Are you aware of the fact that most important aspect of Bio-Medical Waste Management is segregation	46% (n=94)	40% (n=82)	14% (n=29)
5	Are you aware of the Bio-Hazard Symbol	78% (n=160)	22% (n=45)	0
6	Do you Know that maximum time limit for storage of Bio-Medical Waste is 2 days or 48Hrs	48% (n=98)	30% (n=62)	22% (n=45)
7	Do you know that Colour coded bags used for collection of waste should by non-chlorinated	60% (n=123)	15% (n=31)	25% (n=51)
8	Do you know that Bio-Medical Waste is generated during treatment of disease	97% (n=199)	0	3% (n=6)
9	Do you know that an authorization in required for Bio-Medical Waste from Pollution Control Board	47% (n=96)	31% (n=64)	22% (n=45)
10	Do you Know that Record Maintenance is mandatory?	28% (n=57)	39% (n=80)	29% (n=59)

Table 2: Questions and the responses marked by the participants (in %) on Attitude regarding Bio-Medical Waste. (Figures in the parenthesis indicates number of respondents)

Sl	Questions	Yes	No	Don't Know
Attitude				
1	Do you feel that Bio-Medical Waste management is a Team-work	88% (n=180)	0% (n=0)	12% (n=25)
2	Do you feel that regular training programmes should be conducted on BMW	90% (n=185)	10% (n=21)	0% (n=0)
3	Do you know that Bio-Medical Waste goes through step of collection, Transportation & storage before final treatment	68% (n=139)	10% (n=21)	22% (n=45)
5	Do you know the Importance of labelling of Bio-Medical Waste bags	25% (n=51)	45% (n=92)	30% (n=62)
6	Do you feel that colour coding of bins should be strictly implemented for successful Bio-Medical Waste management?	93% (n=191)	6% (n=12)	1% (n=2)
7	Do you think that Bio-Medical Waste management and handling should be a compulsory part of their curriculum?	90% (n=185)	0% (n=0)	10% (n=21)
8	Do you think that a separate and dedicated vehicle is required for the transportation of BMW?	45% (n=92)	35% (n=72)	20% (n=41)
9	General public's health can be adversely affected by biomedical waste?	96.1% (n=197)	0% (n=0)	3.9% (n=8)
10	Deep burial is one another method of disposal of biomedical waste for categories 1,2,3,6?	93.17% (n=191)	2.44% (n=5)	4.39% (n=9)
11	Incineration is appropriate for animal waste, dressing material, human waste, (blood, body fluids, parts and tissues)	95.12% (n=195)	0.98% (n=2)	3.9% (n=8)

	and lab waste?			
12	Incineration is a process where combustible waste is reduced to exhaust gaseous products and incombustible waste is reduced to ash?	75% (n=154)	5% (n=10)	20% (n=41)
13	Microwaving is process which uses microwave radiation to heat and destroy micro-organism?	96.1% (n=197)	0% (n=0)	0.39% (n=1)
14	Microwave disinfection is appropriate for treatment of microbiological lab waste, human blood, body fluid waste, and waste sharps?	93.17% (n=191)	1.46% (n=3)	5.37% (n=11)
15	Autoclaving is a process of sterilization of medical waste using high temperature (121°C) and high pressure (105kpa) for a period of 60 minutes?	92.2% (n=189)	4.39% (n=9)	3.41% (n=7)
16	Treatment chemicals like sodium hydrochloride solution are available for chemical disinfection?	96.1% (n=197)	0.98% (n=2)	2.93% (n=6)
17	Exposure to ultra violet light is also a method of disinfection / decontamination?	55% (n=113)	10% (n=21)	35% (n=72)
18	Needle cutters/destroyer, syringe, crusher, shredder, boiling water sterilizer, autoclaves, microwaves, and incinerator are the hard technologies available for management of biomedical waste?	96.1% (n=197)	0.49% (n=1)	3.41% (n=7)
19	Shredders are used to destroy plastic materials and paper waste material to prevent its resume?	95.12% (n=195)	1.46% (n=3)	3.41% (n=7)

20	Human anatomical waste (cat.1), animal waste (cat.2), microbiological waste and biotechnological waste (cat.3) and solid waste (cat.6) is to be collected in yellow bin which to be sent for incineration /deep burial?	96.1% (n=197)	0.98% (n=2)	2.93% (n=6)
21	Microbiological waste and biotechnological waste (cat.3), soiled solid waste (cat.6) and disposable solid waste (cat.7) Is to be collected in red bin which is to be sent for Autoclaving /Microwaving / Chemical treatment?	94.63% (n=194)	2.44% (n=5)	2.93% (n=6)
22	Waste sharps (cat.4) (after shredding) and solid waste disposable (cat.7) is to be collected in blue bin and sent for Autoclaving / microwaving/ Chemical treatment and destruction?	95.61% (n=196)	0.98% (n=2)	3.41% (n=7)
23	Discarded medicine and cytotoxic drugs (cat.-5)incineration ash (cat.-9) and solid chemical waste (cat.-10) is to be collected in black bins which is be sent for disposal in secured land fill?	95.12% (n=195)	2.44% (n=5)	2.44% (n=5)
24	Liquid waste (cat.-8) and liquid chemical waste (cat.-10) does not require any container bag?	95.61% (n=196)	1.95% (n=4)	2.44% (n=5)
25	All health care personals patients in health care establishment visitors, attendants, and workers in support services are the persons who are at risk to hazards by biomedical waste?	95.61% (n=196)	0.49% (n=1)	3.9% (n=8)

Table 3: Questions and the responses marked by the participants (in %) on Practices regarding Bio-Medical Waste.

(Figures in the parenthesis indicates number of respondents)

SL	Questions	Yes	No	Don't Know
Practice				
1	Do you segregate the waste at the point of generation?	18% (n=37)	62% (n=127)	20% (n=41)
2	Do you segregate the waste after it has been collected in the bins?	70% (n=144)	20% (n=41)	10% (n=21)
3	Do you ensure tying up the waste bag when its 3/4th filled?	10% (n=21)	60% (n=123)	30% (n=62)
4	Do you monitor & ensure that the biomedical waste is managed as per the norms?	65% (n=133)	24% (n=49)	11% (n=23)
5	Improper practices such as dumping of biomedical waste in municipal dustbins, open spaces and water bodies leads to spread of disease?	96% (n=197)	0% (n=0)	4% (n=8)
6	Only waste that is disinfected should be used in a shredder?	3.4% (n=7)	92.68% (n=190)	3.9% (n=8)
7	Gloves, masks, aprons, gowns, boots, eye glasses, shields, long sleeved shirts, long trousers and closed shoes are personal protective devices?	96.1% (n=197)	0% (n=0)	3.9% (n=8)
8	Handling devices include dust pan, trolley, wheel burrows and chutes?	95.12% (n=195)	1.46% (n=3)	3.41% (n=7)
9	Do you maintain the register for BMW at the location of generation?	32% (n=66)	39% (n=80)	29% (n=59)
10	Do you know that biomedical waste management goes through the step of collection	28% (n=57)	30% (n=62)	42% (n=86)

	transportation and storage before final treatment?			
11	Do you know that mixing of biomedical waste with municipal waste is prohibited?	65% (n=133)	5% (n=10)	30% (n=62)
12	Do you know the method to prepare the disinfection solutions with prescribed dilutions?	45% (n=92)	25% (n=51)	30% (n=62)
13	Do you know that monthly and annual records of biomedical waste should be send to authorities?	20% (n=41)	35% (n=72)	45% (n=92)

4. Results and Discussion

Knowledge regarding the time limits for biomedical waste storage was found proper as per the norms, in only 46% (n=98) and surprisingly 54% (n=107) of the participants found to have improper knowledge on waste storage time limits. In the study it was found that 40% (n=107) of the participants even do not know that bags used for collecting BMW should be non-chlorinated. 53% (n=109) of the participants do not have knowledge that a health care facility needs a valid authorization from pollution control board. Substantially and surprisingly 68% (n=139) do not have knowledge that as per BMW management & handling Rules record maintenance is mandatory.

In the study, regarding the attitude of the participants for BMW management 88% (n=180) feels that BMW management is a team work. Substantially 90% (n=185) feels that regular training programs should be conducted for this. Predominantly, 93% (n=191) pretended that color coding of bins should be strictly implemented for successful management of bio-medical waste. It was found that participants are willing to attain knowledge of bio-medical waste management and handling as 90% (n=188) participants believe that it should be a compulsory part of their curriculum. The participants are not well aware of the transportation the bio-medical waste, 55% (n=113) are not aware that separate and dedicated vehicle is required for the transportation of BMW. Preponderantly, 96.1% (n=197) participants knows that bio-medical waste has adverse effect on the general public's health. 95.61% (n=196) knows that all health care personals, patients in health care facility, visitors, attendants and workers in support services are at risk to hazards by bio-medical waste.

95.12% (n=195) of the participants are aware of the purpose of incinerator and type of waste treated whereas only 75% (n=159) are aware of the process of incineration and 25% (n=51) don't know about incineration process. Similarly, 45% (n=93) don't know that exposure to UV light is also a method of disinfection. But 95.12% (n=195) are aware of purpose and use of shredders. Substantially more the 90% of the participants are aware of the waste categories and its respective colour code bins and the mode of treatment.

18% (n=37) responded that they segregate the waste at the point of generation and 82% (n=168) don't act as per rules laid down. Surprisingly, 70% (n=144) respondents segregate the waste after it has been collected in the bins. 90% (n=185) either don't know or don't tie up the waste bags when they are 3/4th filled. But 65% (n=133) ensures that BMW is managed as per norms. 96% (n=197) know that improper practices such as dumping of BMW in municipal dustbins, open spaces and water bodies leads to spreading of diseases. 92.68% (n=190) respondents replied in negative for use of shredder for only disinfected waste. Only 32% (n=66) responded that they maintain a register at the site of generation. 72% (n=148) are not well aware of the protocols regarding the storage of waste collection, transportation to final disposal. 65% (n=133) are aware that mixing of BMW with municipal waste is prohibited. Only 45% (n=92) of the respondents are aware of the method to prepare the disinfection solution with dilution. Surprisingly, only 20% (n=41) know that there are provisions of maintaining and sending monthly and annual reports as BMW generation to the prescribed authorities.

Our findings reveal that nursing professionals had good knowledge about biomedical rules, definitions, bio-hazardous symbol, nature of colour coded bags used. They also had good attitude towards team work, adverse effect of the biomedical waste on general public and health care workers, categorization and treatment as per the rules. But, the study showed nursing professionals had poor or average knowledge and practices regarding the segregation, record keeping, use of color coding, labeling practices, however they are willing to undergo training or orientation programme on biomedical waste management. They are willing to have biomedical waste as a part of their curriculum. Our study also reveals that they were unaware of the golden rule of segregation at the point of generation, time limits for the storage of the biomedical waste and other general guidelines regarding the collection and transportation of waste including the mixing of biomedical waste with general waste or municipal waste. It was found surprising that maximum of the participants follows the secondary segregation of waste rather than at the generation point.

The knowledge and attitude regarding the color codes and mode of the treatments was found to be good among the nursing professionals. But the practice part found to be below acceptance level. they are not aware of segregation techniques role of segregation in BMW management.

In our study we found that participants are not aware of Record keeping, which is very important task in waste management and mandatory task as per the rules, also they were unaware of authorization process from pollution control board. Despite being the nursing professionals, they had poor practices regarding the collection and transportation of biomedical waste. Maximum of the participants thinks that training is essential but ironically few had undergone or participate in such training programme.

Each and every aspect of KAP could not be accessed as the study carried out is based on MCQ questionnaire which is the limitation for our study. Using the questionnaire format the suggestions and the problem faced by the participants could not be obtained by this format.

5. Conclusions

The present study was done to determine the current status of knowledge, attitude and practices regarding bio-medical waste management among nursing professionals in Haldwani city. In our study we found that the nursing professionals needs rigorous training for the implementation of the Bio-medical waste management. The lower level of awareness about hospital waste handling may have direct impact on overall process of safe disposal of biomedical waste. To avoid this, Strict supervision and surveillance should be adopted to follow the golden rule/ thumb rule i.e. segregation at the point of generation. There is a need of conducting or organizing refresher course or orientation programme for nursing professionals at regular intervals.

Acknowledgments

We acknowledge Mrs.Giby Mathew, Mrs Ila Chaudhary, Government Medical College, Haldwani, Mr D. Shishodia, Nancy College of Nursing, Mr Sundaram Bhandari, Pal College of Nursing, Mr Bijoy C Mathew, Droan College of Nursing, for circulating the online proforma to the nursing staff. Mr.Tara Datt Dholgai and Mr Amit Bharari who helped us in typing task and all the nursing professionals who participate in the survey.

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