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KNOWLEDGE ON BIOMEDICAL WASTE MANAGEMENT AMONG NURSES WORKING IN A HOSPITAL OF BIRATNAGAR

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ABSTRACT

Biomedical wastes (BMWs) are the waste generated within the hospital. The increasing number of hospitals in the public and private sectors has made a significant generation of hospital waste. Improper waste management has a direct impact on human health and the environment. The objective of this study is to identify the knowledge on biomedical waste management among nurses in a hospital at Biratnagar. A descriptive cross-sectional study was conducted among nurses working in Neuro Cardio and Multispecialty Hospital. The nonprobability purposive sampling technique was used to collect data from 101 nurses using a semi-structured and self-administered questionnaire. Data entry and analysis were done in Statistical Package for Social Science (SPSS) version 20. Descriptive analysis was done by using mean and standard deviation and in inferential analysis chi-square test was used to find the association between level of knowledge and selected demographic variables. The findings showed that among 101 respondents, the majority (88.1%) had a moderate level of knowledge and there were no associations between nurse's level of knowledge on biomedical waste management and selected demographic variables. It is recommended that continuing education and time to time training classes should be conducted by hospital authorities so that knowledge among nurses on biomedical waste management can be increased.

Keywords: Biomedical waste management - knowledge - nurses - hospital

INTRODUCTION

Bio-medical waste means any waste generated during the diagnosis, treatment, and care of human beings or waste generated in research activities. All such waste that has an impact on the environment or health of a person is considered infectious and has to be managed as per Biomedical Waste Management Rules, 2016 (WHO 2016).Improper waste management will cause Hospital Acquired Infections and poses public health hazards by polluting air, water and soil (Ghimire & Dhungana 2018).To prevent occupational hazards Biomedical waste must be managed properly to protect the environment, the general public, and workers who are involved in handling and management. To improve biomedical waste management in health facilities in a country, the development and implementation of a national waste management policy are needed (Datta, Mohi & Chander 2018).

Biomedical waste management (BMW) is seen as a necessity in health care facilities. Hospitals and nurses are interdependent aspects of biomedical waste management. Regarding the safe management of biomedical waste management, there is role conflict among the generators, operators, decision-makers, and the general community due to a lack of awareness (Chaudhary *et al*. 2014). Based on these facts, an integrated biomedical waste management system for hospitals and health care facilities should be incorporated (Nema *et al*. 2011).

Hospital waste is potentially hazardous to all including the health care workers, general people, and flora and fauna of the area. Out of 13,613.5 tons of waste generated by health institutions across the country every year, up to 25% of waste is hazardous (MOHP 2013). Nurses play a very important role in providing preventive, curative, promotive, and rehabilitative health care services. Nurses are the key personnel of the health care system who are directly or indirectly involved with patient care and hospital facilities. They play a vital role in health protection, promotion, prevention, and treatment while providing services (Mir *et al.* 2013) Awareness regarding biomedical waste management contributes to the proper disposal of hazardous waste and protects the community and environment from its potential impact. So, the capability to understand and maintain and implement effective management of biomedical waste is the responsibility of nurses as well (Radha 2012).

The proper management of biomedical waste is an issue that needs to be addressed worldwide. It is crucial to assess the knowledge of

biomedical waste management among nurses to make the environment safe and prevent its hazards. In our country, few research was done on this topic so the researchers were interested to carry out the study. The objective of this study is to assess the knowledge of biomedical waste management among the nurses working in a hospital in Biratnagar.

METHODS AND MATERIALS

A descriptive cross-sectional study was conducted to assess the knowledge on biomedical waste management among the nurses working in a Neuro Cardio & Multispecialty hospital located in Biratnagar-10. The hospital was selected as per the convenience of researchers as researchers were familiar with the management and physical closeness of the hospital. The study population was the nurses working in the indoor department of Neuro Cardio & Multispecialty hospital of Biratnagar. Sampling size is calculated according to the derived formula z^2pq/d^2 where z = 1.96 (at 95% confidence level), P= 60% = 0.6 (taking 'p' from level of knowledge on biomedical waste management among nurses in Shimla, Himachal Pradesh, India, (Amita *et al*. 2017) and d = allowable error (10% = 0.1). Thus, keeping 10% as the non-response rate, the desired sample size is 101. Data were collected from 101 nurses using a non-probability purposive sampling technique through Semi-structured and self-administered questionnaires. Tools were divided into two parts such as Part I- which consists of socio-demographic information (age, education status, designation, training, experience, hospital policy) Part II- Knowledge on biomedical waste management. It included a questionnaire related to the meaning of biomedical waste management, colour coding, and segregation of waste, methods of waste disposal, biohazard symbols, sources of knowledge on biomedical waste management, etc. There were 34 semi-structured questions with dichotomous (Yes/No), multiple-choice, and multiple responses questions in the knowledge section. Each question related to knowledge carried 1 mark and each correct response carried 1 mark in case of multiple responses. All questions were formulated in English. By summing the scores total score was obtained and interpreted as inadequate knowledge: 0-50%, Moderate knowledge: 51-75%, and adequate knowledge: 76-100% (Panneerselvam 2016). The validity of the instrument was maintained by literature review and consulting with the expertise of the concerned subject. Pretesting was done on 10% of the total sample.

Approval was taken from the Research Management Committee of Biratnagar Nursing Campus before collecting data. Written permission to conduct the study was taken from the administrator of Neuro Cardio & Multispecialty Hospital. After explaining the component of the information sheet written informed consent was taken from each respondent. Confidentiality of information of all respondents was maintained throughout the study. Respondents were not forced by any means to participate in the study. They were given the freedom to withdraw their participation at any time during the study. Data were collected by the researchers themselves from 2019 June 2 to June 14. Each individual was provided 30 -35 minutes to respond to all the questions.

Data entry and analysis were done by using the computer Statistical Package for the Social Sciences (SPSS) version 20. Descriptive analysis was done by using mean and standard deviation to assess the level of knowledge on biomedical waste management among nurses of the private hospitals. In inferential analysis, chi-square was used to find the association between knowledge on biomedical waste management among nurses and socio-demographic variables. With a 5% level of significance P-value of <0.05 was considered to indicate significance.

RESULTS AND DISCUSSION

The findings showed that among 101 respondents, 58.4% were from the 21 to 25 years age group,74.3% were PCL nursing and 20.8% of respondents were BN/BSC nursing and 5% the respondents were ANM. Regarding work experience, half of the respondents (49.5%) belonged to < 1 year of working experience. Similarly, almost all of the respondents (95.0%) had not received any training on biomedical waste management, and 60.4% of respondents were known of penalties for inappropriate waste disposal. Almost all of the respondents (96.0%) had knowledge about the correct meaning of biomedical waste. Likewise, 74.3% of respondents answered on the correct symbol of biohazards. Regarding the treatment of biomedical waste, 28.7% of respondents answered untreated biomedical waste should not be stored beyond 48 hours. Similarly, all of the respondents (100%) were aware of inappropriate biomedical waste management and its effects on the environment and health. All of the respondents (98.0%) and (100 %) were aware of inappropriate biomedical waste management and its outcome on health and the environment respectively. Likewise, the majority of the respondents (84.2 %) believed that inappropriate waste disposal can

cause dysentery as a health hazard and 94.1 % of respondents believed in water pollution as an environmental hazard.

Table 1: Knowledge on biomedical waste management

Variables	Frequency (f)	Percentage (%)
Meaning of biomedical waste		
Waste usually generates from health care activities	97	96.0
Knowledge on symbol/logo of biomedical waste		
Yes	94	93.1
No	7	6.9
Symbol of biohazards (n=94)		
	75	79.8
	16	17
	2	2.1
	1	1.1
Proportion of infectious waste among total waste in (%)		
10-20	11	10.9
Regulatory body for the transport of biomedical waste		
Pollution Control Board	26	25.7
Untreated biomedical waste should not be stored beyond (in hours)		
48	29	28.7
Composition of hospital waste management committee*		
The Housekeeper	82	81.2
The Matron	77	76.2
Representative from support staff e.g. Sweeper	76	75.2
The Head of all hospital departments	74	73.3
The Hospital Superintendent	66	65.3
The Head of Administration	61	60.4
The Radiology Officer	28	27.7
Hospital Engineer	27	26.7
The Chief Pharmacist	18	17.8

**Multiple response-correct answer*

Source- Survey Results 2019

The majority of the respondents (83.2%) were aware of the risk involved in handling biomedical waste and more than half of the respondents (69.3%) were aware of generated waste and their proper methods of disposal. Similarly, 74.3% of respondents believed in the teamwork of health care workers and other responsible personnel for the responsibility of safe management of biomedical waste and only 2.0% of respondents believed in the responsibility of only government.

Similarly, 88.1% had moderate and 3.0 % of respondents had an inadequate level of knowledge on Biomedical waste management. Likewise, there was no association between the level of knowledge on biomedical waste and demographic variables.

Table 2: knowledge on colour coding system of biomedical waste management

Variables	Frequency(f)	Percentage (%)
Colour code used forsegregation of biomedical waste*		
Yellow	100	99.0
Blue	98	97.0
Red	97	96.0
Black	97	96.0
Green	72	71.3
Biomedical waste should be autoclaved in		
Blue bin	44	43.6
Color for human anatomical waste collection		
Yellow bin	63	62.4
Colour for Biodegradable wastecollection		
Green bin	71	70.3
Colour for Infectious non degradable waste collection		
Red bin	29	28.7
General waste should be collected in		
Black bin	89	88.1

*****_Multiple response-correct answer_

Source-Survey Results 2019

Table 3: knowledge on methods of biomedical waste management & its disposal

Variables	Frequency (f)	Percentage (%)
Methods used in biomedical waste management*		
Collection	97	96.0
Segregation	93	92.1
Disposal	90	89.1
Transportation	82	81.2
Storage	71	70.3
Treatment	44	43.6
Treatment options for biomedical waste management*		
Incineration	98	97.0
Chemical treatment	87	86.1
Autoclave	85	84.2
Deep burial	73	72.2
Disposal in secured land fills	57	56.4
Microwave	33	32.7
Destruction	27	26.6
Shredding	21	20.8
Common & effective treatment of biomedical waste management		
Incineration	49	48.5
Autoclave *	23	22.8
Deep burial	12	11.9
Disposal in secured land fills	9	8.9
Chemical treatment	8	7.9
Safe handling measures for biomedical waste*		
Use personal protection equipment's like gloves, mask, protective glasses, gum boots etc.	98	97.3
Be aware of risk involved in handling biomedical waste	84	83.2
Use the principle of waste management during time of waste disposal	78	77.2
Be aware of generated waste and their proper methods of disposal	70	69.3

**Multiple Answer-Correct answer*

Source-Survey results 2019

Table 4: Association between level of knowledge & selected demographic variables

	Level of knowledge			
Variables	**Inadequate f (%)**	**Adequate (%)**	**f**	**p-value**
Age group(years)				
<25	80(79.2)	3(3.0)		0.413
≥25	18(17.8)	0(0.0)		
Academic Qualification				
ANM	4(4.0)	0(0.0)		0.585
PCL	72(71.3)	3(3.0)		
BN/BSc.	22(21.8)	0(0.0)		
Designation				
Ward in-charge	2 (2.0%)	0 (0.0%)		0.803
Ward staff	96 (95.0%)	3 (3.0%)		
Work experience				
<3years	80 (79.2%)	3(3.0)		0.413
≥3years	18 (17.8%)	0(0.0)		
Training on biomedical waste management				
Yes	5(5.0%)	0 (0.0%)		0.688
No	93(92.1)	3 (3.0%)		

Source-Survey Results 2019

This study showed that almost all the respondents (96%) knew the correct meaning of biomedical waste which is a contrast to the study done in Tamil Nadu with a sample size of 200 which showed 40.44% of nurses were aware on a biomedical waste concept (Balamurugan *et al*. 2014). The observed difference in study findings might be due to the difference in setting and sociodemographic characteristics of the two studies. This study showed that all the respondents (100%) had knowledge of colour coding segregation of biomedical waste which is supported by finding study done in Delhi by Soyam GC *et al*. (2017) which showed 79.2 % of nurses were known about segregation of biomedical waste management. Similarly, a study showed knowledge of color coding and segregation was better among nurses and laboratory staff than doctors (Mathur *et al*. 2011). The finding of the study showed that 74.3% of respondents knew the correct

symbol of biohazards coherence with the finding of the study done in West Bengal, India with a sample size of 198 in which 62.6% of respondents had knowledge about the biohazards symbol (Das & Biswas, 2016).

The findings showed 28.7% of respondents were known untreated biomedical waste should not be stored beyond 48 hours for proper waste management which is similar to the study done in Nagara with a sample size of 441 which showed 36.5% of respondents were known that waste should not be stored beyond 48 hours (Radha 2012).In this study, most of the respondents (70.3%) had answered correctly about the recognition of colour coding systems for biomedical waste supported by the study conducted in Delhi, India where the majority of nurses (84.1%) answered correctly about the color-coding system of biomedical waste management (Soyam GC *et al.* 2017). Similarly, another study showed good knowledge of color-coding among the respondents as 95.3% said color coding for medical waste is red, and 99.4% said Sharp medical waste must be discarded into a hard container (Akkajit *et al*. 2020), whereas it contrasts with another study that revealed knowledge of bio-medical waste color coding and risks of handling was poor among health workers and class-IV waste handlers (Ismail *et al.* 2013)

The findings showed that 66.3% answered correctly about questions related to the correct sequence of biomedical waste management. Similarly, 44.6% of the respondents knew about biomedical waste disposal, supported by the study conducted in Pakistan in which 56% of nurses had knowledge of the disposal of infectious waste (Kumar, Samrongthong, Shaikh 2013). In this study 97.0% of respondents had used personal protective equipment while handling the biomedical waste which is similar to the study conducted in Uttar Pradesh, India by Imtiaz *et al*. (2014) showed that 81.4% of nurses had used personal protective equipment while handling the waste.

This study revealed that 88.1% of respondents had a moderate level of knowledge of biomedical waste management whereas only 8.9% of respondents had adequate knowledge which is supported by the findings of the study showed 36% of nurses had poor knowledge of waste management (Sharma *et al.* 2013) whereas it contrasts with study findings done in Hospital at Madurai. The findings showed that 77 % of the respondents achieved adequate scores for their knowledge of biomedical waste management. The reasons might be due to differences in the sample size and work experience. The study was conducted in Christian Mission Hospital in Madurai, India

where the sample size was 30 and most of the respondents had less than 5 years of working experience (Panneerselvam, 2016) whereas in the present study most of the respondents had less than 1 year of working experience. likewise, the findings of the study are also supported by a study that showed that Knowledge about biomedical waste management rules among the technically qualified personnel like the doctors, nurses, and laboratory staff have satisfactory whereas it was low among the attenders and housekeeping staff (Madhukumar & Ramesh 2012). Similarly, a study showed that knowledge of biomedical waste management among nurses 91.4% was greater than among lab technicians 84.7% (Imtiaz *et al.* 2014).

This study showed that there is no association between level of knowledge with educational qualification, years of experience which is coherence with the findings of the study conducted in Shimla, Himachal Pradesh, India in which level of knowledge is not significant with educational qualification and work experience (Amita *et al.* 2017)

Similarly, the findings reflected that level of knowledge is not significant with age, training supported by the study conducted in Madurai by Panneerselvam (2016) who documented that age, and training did not influence the knowledge.

CONCLUSION

It can be concluded from the present study that moderate level of knowledge among nurses regarding biomedical waste management in a hospital in Biratnagar. Also, there was no association between level of knowledge and selected demographic variables. Based on the study findings, it can be recommended to include periodic training, continuing education, and monitoring on biomedical waste management for all categories of hospital staff. Training the staff with checklists and regular inspections can bring about accountability in the staff which can increase knowledge on biomedical waste management and also can avoid cross infections among the staff of hospital.

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