

Assessment of educational intervention on biomedical waste management among Government Nursing College students, Bengaluru

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Abstract

Background: The World Health Organization states that only 20% medical waste is hazardous—toxic, infectious, or radioactive. The Gazette of India has specific details about segregation and disposal of biomedical waste. Among the health-care workers, it is the nurses who deal with the patients for most part of their hospital stay and thus are the closest to dealing with most of the biomedical waste generated. Good training in the nursing college days would lead to responsible handling, segregation, and disposal of this waste. This will indeed go a long way in curbing spread of disease and also occupational hazards among the subsequent handlers of this waste.

Objective: To assess the knowledge, attitude, and practice toward handling of biomedical waste among nursing students, before and after an educational intervention.

Materials and Methods: An interventional study conducted at Government Nursing College, Bengaluru. Among first-, second-, and third-year nursing students, 154 were assessed using an indigenous pretested questionnaire. Data were collected before and after 4 weeks of the intervention. Statistical analysis was carried out as frequency distribution in the form of percentage tables and bar diagrams.

Result: Knowledge improved in all years, from 22.3% in first year, 17.5% in second year to 7.8% in third year. Pretest average score was 18.942 and the posttest average score improved to 19.695. There was improvement in practice ranging from 34.7%, 19.7%, to 8.8% in first, second, and third years of nursing, respectively.

Conclusion: Knowledge, attitude, and practice have improved postintervention—given in the form of health education.

KEY WORDS: Biomedical waste, knowledge, attitude, practice, nursing students


Introduction

The World Health Organization defines medical waste as waste generated by health-care activities, from used needles and syringes to soiled dressings, body parts, diagnostic

samples, blood, chemicals, pharmaceuticals, medical devices, and radioactive materials. Only 20% of this health-care waste produced is hazardous.^[1]

Not only does improper disposal of biomedical waste such as anatomic waste is an eye sore to the public but it is also a huge public health concern. Gastrointestinal infections of *Salmonella*, hepatitis A through feces or vomitus, human immunodeficiency virus, and hepatitis B via blood and body fluids, infected sputum samples leading to tuberculosis are only to name a few. Cytotoxic drugs (alkylating agents) are powerful irritants on eyes and skin. Radioactive waste exposure can cause headache, dizziness, vomiting, genotoxicity, and tissue damage. Infected sharps can lead to physical injuries and further spread of bloodborne diseases.^[2]

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All health-care workers involved in dealing with biomedical waste shoulder the responsibility of its proper segregation and disposal. Among them, the nursing staff are involved in maximum patient care, throughout the period of stay in the hospital. The nature of their job deals the most with management of biomedical waste. It is thus of utmost importance that a critical part of the nursing training is dealt with judicious handling of this hazardous waste. Hence, this study was conducted on nursing students to assess their knowledge, attitude, and practice in handling biomedical waste.

Objective

This study aimed to assess the knowledge, attitude, and practice toward handling of biomedical waste among nursing students, before and after an educational intervention.

Materials and Methods

The study was conducted among nursing students of two government nursing colleges in Bengaluru. Both the nursing colleges cater to tertiary-level hospitals where responsible management of biomedical waste is of utmost importance. This study was undertaken in the period between July 2014 and December 2014. A pretested, semi-structured indigenous questionnaire was designed with information on knowledge, attitude, and practice of biomedical waste among nursing students.

The questionnaire was administered to 154 nursing students. Following which an educational intervention in the form of presentations on the latest guidelines and rules of handling biomedical waste were taught. A number of focused group discussions were undertaken. The doubts of the students were clarified and they realized their contribution in handling biomedical waste would go a long way in a healthier society. After a time gap of 4 weeks, the nursing students were again administered the same questionnaire to assess the impact of the educational intervention.

Statistical Analysis

A total of 154 nursing students participated both in the pre- and posttest. The students were assured of confidentiality. Data were then tabulated and analyzed using Microsoft Excel 2007 and SPSS software, version 16. Data were tabulated as frequency tables and bar diagrams with comparison of pre- and posttest.

Results

Knowledge was assessed based on indigenously designed questions (Table 1). Questions 1–7 included identifying if materials such as the human placenta, wrapper of tablets, unused chemotherapy drugs, IV tubings and catheters, unused cotton swabs, unused needles, and amputated limb fell into biomedical waste category or not.

Knowledge was assessed if the nursing students knew in which color bin they needed to drop various biomedical

Table 1: Knowledge

Biomedical waste	Correct choice	
	Pretest n (%)	Posttest n (%)
1. Human placenta		
I 50 (100%)	41 (82)	44 (88)
II 55 (100%)	50 (90.9)	51 (92.7)
III 49 (100%)	48 (97.9)	49 (100)
2. Wrapper after tablets are consumed		
I 50 (100%)	4 (8)	22 (44)
II 55 (100%)	10 (18.2)	33 (60)
III 49 (100%)	25 (51)	45 (91.8)
3. Unused chemotherapy drugs		
I 50 (100%)	7 (14)	15 (30)
II 55 (100%)	12 (21.8)	35 (63.6)
III 49 (100%)	35 (71.4)	48 (97.9)
4. IV tubings and catheters		
I 50 (100%)	43 (86)	48 (94)
II 55 (100%)	50 (90.9)	52 (94.5)
III 49 (100%)	48 (97.9)	49 (100)
5. Unused cotton swabs		
I 50 (100%)	10 (20)	29 (58)
II 55 (100%)	35 (63.6)	39 (70.9)
III 49 (100%)	45 (91.8)	47 (95.9)
6. Unused needle/sharp		
I 50 (100%)	5 (10)	15 (30)
II 55 (100%)	20 (36.3)	40 (72.7)
III 49 (100%)	45 (91.8)	49 (100)
7. Amputated limb		
I 50 (100%)	32 (64)	43 (86)
II 55 (100%)	45 (81.8)	50 (90.9)
III 49 (100%)	49 (100)	49 (100)
8. Knowledge about color bins		
I 50 (100%)	19 (38)	38 (76)
II 55 (100%)	40 (72.7)	45 (81.8)
III 49 (100%)	49 (100)	49 (100)
9. There are authorized vehicles for waste collection?		
I 50 (100%)	33 (66)	43 (86)
II 55 (100%)	45 (81.8)	50 (90.9)
III 49 (100%)	48 (97.9)	49 (100)
10. Human and animal waste are incinerated?		
I 50 (100%)	18 (36)	30 (60)
II 55 (100%)	40 (72.7)	50 (90.9)
III 49 (100%)	48 (97.9)	49 (100)
11. Can sharps be buried deep in landfills without mutilation?		
I 50 (100%)	20 (40)	29 (58)
II 55 (100%)	30 (54.54)	42 (76.3)
III 49 (100%)	45 (91.8)	48 (97.9)

^aKnowledge about color bins was assessed on lab culture plates, blood-stained swabs, human placenta, used or unused needles, plaster of Paris, used vaccine vials, broken glass pieces, blood-stained plaster, amputated limb, IV tubings.

wastes. Some of them were lab culture plates, blood-stained swabs, human placenta, used or unused needles, plaster of Paris, used vaccine vials, broken glass pieces, blood-stained plaster, amputated limb, and IV tubings. An average of the

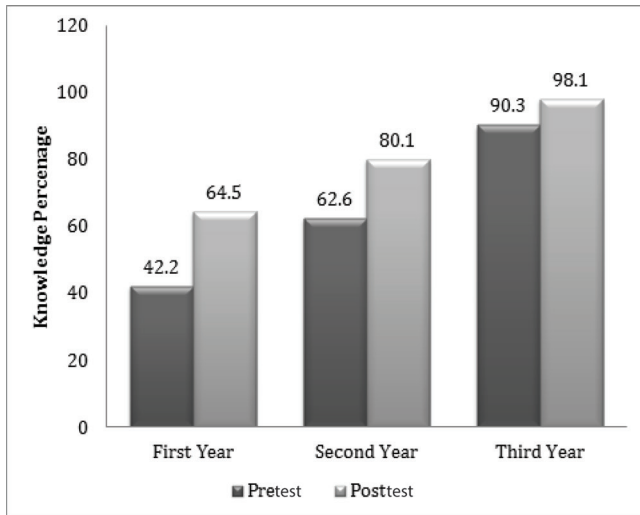


Figure 1: Overall knowledge percentage for each year.

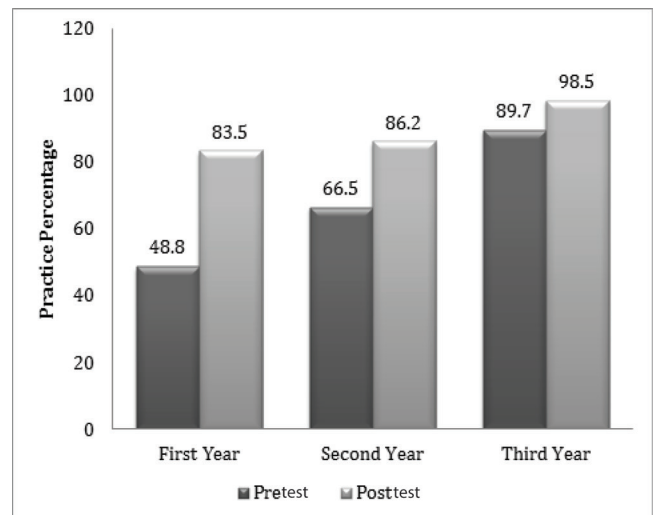


Figure 2: Overall practice percentage for each year.

right answer among all the color bins was taken for each year of nursing and tabulated (Table 1—Question 8).

The last three questions (Table 1—Questions 9–11) were based on transportation of biomedical waste, incineration, and deep burial of sharps. All the questions assessing knowledge were tabulated based on each year of nursing.

Results on knowledge were tabulated both before and after the educational intervention separately for 3 years of nursing. An overall knowledge percentage was tabulated summing up the knowledge scores for all the 11 questions across the 3 years of nursing [Figure 1]. The first-year nursing students had 22.3% improvement, second-year nursing students had 17.5% improvement, and third-year students had 7.8% overall improvement in knowledge. Few aspects the students lacked knowledge were disposal of mercury and detailed steps of management of a blood spill. Training was given about the various steps to be followed in management of a blood spill.

The attitude of the students was graded using five-point Likert scale from “Strongly Agree” to “Strongly Disagree”—with scores ranging from 4 to 1 [Table 2]. Questions 1 and 4 were negatively worded and so the scoring was reversed for these questions. Pretest average score was 18.942 and the

posttest average score was 19.695. Attitude toward biomedical waste has improved after educating the students with a maximum increase in managing disposing of needles in puncture-proof containers from 85.8% to 95.5%.

Finally, the students were assessed based on whether they put all their knowledge into practice or not. Practice was assessed with seven questions [Table 3] based on universal precautions, usage of hub cutter, dropping needles in puncture-proof containers, disinfection of sharps, usage, segregation of biomedical waste, and attitude toward colleagues if practicing wrongly. Results were tabulated both before and after the educational intervention separately for each year of nursing and an overall practice percentage is shown as bar diagram [Figure 2]. There was 34.7%, 19.7%, and 8.8% improvement among first-, second-, and third-year nursing students, respectively.

Discussion

A study by Margabandu and Balasubramaniam^[3] among nurses showed that 94% of them had knowledge regarding health-care waste management. Another study by Bhagwat

Table 2: Attitude

Answer the following questions?	Pretest		Posttest	
	Agree	Disagree	Agree	Disagree
1. It is important to segregate biomedical waste	142 (91.6)	13 (8.4)	153 (99.3)	1 (0.6)
2. It is a burden to choose the bins for each type of waste	75 (61.7)	59 (38.3)	75 (61.7)	59 (38.3)
3. Improper segregation will increase bulk of BMW	121 (78)	34 (21.9)	130 (84.4)	24 (15.6)
4. In spite of my segregation waste is mixed up in the end	59 (38.1)	96 (61.9)	48 (31.1)	106 (68.8)
5. It is important to always dispose needles in puncture-proof containers	133 (85.8)	22 (14.2)	147 (95.5)	7 (4.5)
6. Segregation saves the environment from polluting	146 (94.2)	9 (5.8)	149 (96.8)	5 (3.2)

Table 3: Practice

Practice	Pretest n (%)	Posttest n (%)
1. I always wear gloves while drawing blood samples		
I 50 (100%)	32 (64)	49 (98)
II 55 (100%)	35 (63.6)	55 (100)
III 49 (100%)	45 (91.8)	49 (100)
2. I do not recap the needle after an injection		
I 50 (100%)	12 (24)	30 (60)
II 55 (100%)	20 (36.3)	40 (72.7)
III 49 (100%)	40 (81.6)	46 (93.8)
3. I always use the Hub Cutter after giving an injection		
I 50 (100%)	19 (38)	41 (82)
II 55 (100%)	40 (72.7)	45 (81.8)
III 49 (100%)	43 (87.7)	48 (97.9)
4. I always drop a needle in a puncture-proof containers		
I 50 (100%)	25 (50)	41 (82)
II 55 (100%)	40 (72.7)	45 (81.8)
III 49 (100%)	45 (91.8)	49 (100)
5. I always ensure needles are disinfected before		
I 50 (100%)	15 (30)	36 (72)
II 55 (100%)	36 (65.5)	40 (72.7)
III 49 (100%)	45 (91.8)	48 (97.9)
6. I ensure waste is dropped in the right colored bins		
I 50 (100%)	35 (70)	46 (92)
II 55 (100%)	40 (72.7)	52 (94.5)
III 49 (100%)	45 (91.8)	49 (100)
7. I correct my colleagues if they drop waste wrongly		
I 50 (100%)	36 (65.5)	49 (98)
II 55 (100%)	45 (81.8)	55 (100)
III 49 (100%)	45 (91.8)	49 (100)

et al.^[4] found that only 70.6% health-care workers were aware of biomedical waste management.

From the assessment of knowledge of categorizing as biomedical waste, all areas improved. More focus is needed on management of needles and sharps whether used or not to be considered as potential health hazard. Knowledge regarding the color of bins was good. In addition, with training there was improvement. Maximum improvement was seen in the first-year nursing students with 22.3% improvement.

In a study conducted by Goswami et al.,^[5] the entire study group had a positive attitude toward biomedical waste management. Attitude and practice in this study were found to improve after the training sessions. In a similar study conducted by Sachan et al.,^[6] 60% nurses had a positive attitude toward biomedical waste management. The attitude toward biomedical waste management was positive, and there was an improvement after an intervention. More focus can

be placed in areas where the students are always confused about choosing the right colored bins. Emphasis needs to be placed among students that waste is not mixed up in the end and that great measures are taken to ensure the proper transportation and disposal of the biomedical waste.

Practice among the students improved in all the years and among all the parameters questioned. Just like knowledge, maximum improvement in practice was seen among the first-year nursing students at 34.7% improvement.

Conclusion

Knowledge, attitude, and practice have improved postintervention, given in the form of health education. Awareness about management of a blood spill and disposing of mercury has to be further emphasized. More such studies can be conducted to ensure students are updated about any changes in guidelines. Also, this would go a long way in contributing to a safer and healthier society.

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