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Research Article

A Study to Assess the Effectiveness of Planned Teaching Program on Knowledge Regarding Biomedical Waste Management among Staff Nurses Working in Selected Hospitals of Navi Mumbai

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Abstract

Aim: The aim of this study was to evaluate the effectiveness of planned teaching program on knowledge regarding biomedical waste management among staff nurses. **Materials and Methods:** An evaluative research approach with pre-experimental one-group pre-test, post-test research design was used for the study. The study was conducted at Yerala Medical Hospital of Kharghar and Dr. Yewale Multispeacialist Hospital for children of Navi Mumbai. The sample comprised 60 staff nurses working in the selected hospitals. Sample was selected using convenient sampling technique. Data were collected using a structured knowledge questioner. Data were analyzed using descriptive and inferential statistics. Paired t-test was used to assess the effectiveness of planned teaching program on knowledge regarding BMWM. **Results:** The result of this study showed that the level of knowledge has increased in the post-test evaluation and the structured teaching programs given to the nurses are effective and knowledge is increased that the result is shown in post-test score. In which about 40% of nurses attended the BMWM program and 60% of nurses attended any program or seminar related to biomedical waste management. About 91.66% of the samples were G.N.M and 8.33% was P.B.B.Sc. There is a significant association of pre-test score with educational qualification of samples, $t = 2.92$. There is highly significant association of pre-test score with previous participation in program related to biomedical waste management of samples. **Conclusion:** The findings of the study concluded that the planned teaching program on BMWM was effective in improving the knowledge of staff nurses.

Key words: Assess, Biomedical waste management, Effectiveness, Planned teaching program

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Introduction

"Biomedical waste" is any waste, which is generated during diagnosis, treatment, or immunization of human beings. This waste is also generated during research activities or in the production or testing of biological material.

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The nurses spend maximum time with patients in the ward than any other member of the health team, increases their exposure and risk to the hazards present in hospital environment, mainly biomedical waste. They need to be well equipped with latest information, skills, and practices in managing this waste besides reducing hospital-acquired infections to protect their own health. They are also responsible for preventing risk due to waste to the other members of health team and community at large.[1]

Nurses frequently get needle injuries that increase chances of infections, mainly HIV and hepatitis B and C. In one study, it was found that there were around 700 injuries per 1000 nursing staff per week out of which 60% were due to needles

occurred during recapping or handling but very few were due to discarded sharps. It is also found that the present awareness among health personnel is poor regarding biomedical waste management and imparting training do improve their attitude and practices. Even the Central Pollution Control Board, the Ministry of Environment and Forests has recommended that there should be a course on biomedical waste management in undergraduate nursing curriculum.[2]

Health and safety of the nursing staff is cardinal feature of biomedical waste management. The medical superintendent or head of the institute must provide training to strengthen their skills for safety. Although biomedical waste management cannot be achieved without the cooperation of each and every worker and patient, the nursing personnel play a significant role in this whole process. They need to be informed about current available technology to deal biomedical wastes. The sound knowledge and safe practices among all health-care staffs need to be strengthened.[2]

Worldwide, an estimated 16 billion injections are administered every year. Not all needles and syringes are disposed of safely, creating a risk of injury and infection and opportunities for reuse.[3]

Injections with contaminated needles and syringes in low- and middle-income countries have reduced substantially in recent years, partly due to efforts to reduce reuse of injection devices. Despite this progress, in 2010, unsafe injections were still responsible for as many as 33,800 new HIV infections, 1.7 million hepatitis B infections, and 315,000 hepatitis C infections.[4]

A person who experiences one needlestick injury from a needle used on an infected source patient has risks of 30%, 1.8%, and 0.3%, respectively, of becoming infected with HBV, HCV, and HIV.[4]

Additional hazards occur from scavenging at waste disposal sites and during the handling and manual sorting of hazardous waste from health-care facilities. These practices are common in many regions of the world, especially in low- and middle-income countries. The waste handlers are at immediate risk of needlestick injuries and exposure to toxic or infectious materials.[3]

In 2015, a joint WHO/UNICEF assessment found that just over half (58%) of sampled facilities from 24 countries had adequate systems in place for the safe disposal of health-care waste.[5]

The nurses spend maximum time with patients in the ward than any other member of the health team, it increases their exposure and risk to the hazards present in hospital environment, mainly from biomedical waste. They need to be well equipped with latest information, skills, and practices in managing this waste besides reducing hospital-acquired infections to protect their own health. They are also responsible for preventing risk due to waste to the other members of health team and community at large (AFACFO, 2002). The improper management in biomedical waste causes environmental problems that cause to air, water, and land pollution.[6]

Materials and Methods

Research approach

The research method adopted for the present study is evaluative approach.

Research design

In the present study, the investigator selected the pre-experimental one-group pre-test, post-test research design, keeping in the view of objectives of the study.

Variables

Dependent variables

The dependent variable of this study is knowledge of nurses working at selected hospitals in Navi Mumbai regarding biomedical waste management.

Independent variables

The independent variable is structured teaching program regarding biomedical waste management.

Setting of the study

Yerala Medical Hospital of Kharghar and Dr. Yewale Multispeacialist Hospital for children of Navi Mumbai.

Population

The population of the study is staff nurses working in hospitals.

Sample and sampling technique

In the present study, nurses working in selected hospital of Navi Mumbai using convenient sampling technique by the investigator.

Sample size

Total sample size for this study is 60 nurses from Yerala Medical Hospital of Kharghar and Dr. Yewale Multispeacialist Hospital for children of Navi Mumbai.

Sampling criteria

Inclusion criteria

The following criteria were included in the study:

- The nurses who have willingness to participate in the study
- The registered nurses (GNM, P.B.B.Sc, B.Sc, and M.Sc) who are working as nursing staff in selected hospitals at Navi Mumbai

- Registered nurses, who can understand, read, speak, and write the Marathi or Hindi or English.

Exclusion criteria

The following criteria were excluded from the study:

- The staff nurses who may not be available at time of post-test
- Staff nurse who is working as infection control nurse
- Staff nurse who is imparting health education/program/training on.

Interpretation of score

It was prepared coding for Part "A" which consists of demographic variable and for Part "B." Part "B" consisted of 25 multiple-choice questionnaires to assess the knowledge of nurses working in selected hospital. One mark will be given for each correct response and zero mark is given for each wrong response and also for not responded questions. The range of possible score varies from a minimum of 0 to maximum 25 marks, which is represented in the form of percentage for interpretation.

- Very poor 0–15%
- Poor 15–25%
- Average 25–50%.

Statistics

Descriptive statistics

Frequency and percentage distribution are used to analyze the demographic data.

Inferential statistics

Paired *t*-test was to assess the effectiveness of planned teaching program on knowledge regarding BMWM.

Results

The data were entered into master sheet for tabulation and statistical processing the obtained data were analyzed, organized, and presented under the following headings:

- Section I: Analysis of the demographic data of the samples
- Section II: Analysis of data related to effectiveness of structured teaching program on biomedical waste management
- Section III: Effectiveness of structured teaching program on various aspects of biomedical waste management.

Section I: Analysis of the demographic data of the samples

This section deals with analysis of the distribution of samples according to frequency, percentage, and cumulative frequency.

Data presented in Table 1 show out of 60 samples, regarding the majority 58.33% of samples belong to the age group of 20–25 years of age while in the age group of 35–40 years, only 3.33% of samples belong to this category. About 86.66% of the samples were female and 13.33% of the samples were male. About 91.66% of nurses education qualification is high in G.N.M, while 8.33% of nurses education qualification is P.B.B.Sc. About 40% of nurses attended the BMWM program and 60% of nurses attended any program or seminar related to biomedical waste management. About 91.66% of the samples were G.N.M and 8.33% was P.B.B.Sc [Table 1].

Table 1: Analysis of demographic data of the samples. *n*=60

Demographic variables	Frequency	Percentage	Cumulative frequency
Age			
20–25	35	58.33	58.33
25–30	13	21.67	80
30–35	04	6.66	86.66
35–40	02	3.33	89.99
40 above	06	10	100
Gender			
Male	08	13.33	13.33
Female	52	86.66	100.0
Clinical experience in year			
0–5	40	66.66	66.66
5–10	11	18.33	84.99
10–15	04	6.66	91.65
15–20	01	1.66	93.31
20 above	04	6.66	100.0
Attended BMWM program			
Yes	24	40	40
No	36	60	100
Education qualification			
G. N.M	55	91.66	91.66
P.B.B.Sc	05	8.33	100.0
B.Sc	00	00	
M.Sc	00	00	

Section II: Analysis of data related to effectiveness of structured teaching program on biomedical waste management

This section deals with frequency and percentage of pre- and post-test which has been calculated to compare the knowledge level of the samples regarding biomedical waste management and description of significant difference between pre- and post-test by paired sample test.

Table 2 shows the comparison between the level of knowledge at pre-test and post-test of structured teaching program regarding biomedical waste management.

Table 2: Comparison between pre-test and post-test knowledge score

Interpretation	Pre-test		Post-test	
	Frequency	Percent	Frequency	Percent
Excellent	3	5	24	40
Good	8	13.33	19	31.66
Average	30	50	14	23.33
Poor	15	25	03	5
Very poor	4	6.66	00	00
Total	60	100.0	60	100.0

We can observe that the level of knowledge has increased in the post-test evaluation. This shows that the teaching program is fruitful [Table 2].

Section III: Effectiveness of structured teaching program on various aspects of biomedical waste management

This section deals with pre-test and post-test score which has been calculated to check the effectiveness structured teaching program on various aspects of biomedical waste management. To check the effectiveness, difference of score has calculated and supported by *t*-test and significant value as depicted.

Dependent T-test formula applied…
No. of sample (n) = 60
Σd=563
Σd^2= 15,759

$$d = \frac{\sum d}{n} = \frac{563}{60} = 9.38 \quad (1)$$

$$S = \frac{\sqrt{\sum d^2 - n\,(d)^2}}{n-1} \quad (2)$$

$$S = \frac{\sqrt{15759 - 60.\,(87.98)}}{60-1} \quad (3)$$

S = 13.32
Calculated value = 13.32
Table value = 2.92.
Therefore, table value < calculated value.

Table 3 depicts that there is a significant difference in pre-test and post-test; so, the null hypothesis is rejected and the alternative hypothesis is accepted. Therefore, this indicates that the structured teaching programs given to the nurses are effective and knowledge is increased that the result is shown in post-test score [Table 3].

Discussion

The findings of this study have been discussed with reference to the objectives and hypothesis. The pre-testing of nurse's knowledge regarding biomedical waste management shows that nurses have less knowledge about biomedical waste management. This indicates the need for imparting necessary education and information regarding biomedical waste management.

In this study, 91.66% of the nurses educational qualification were GNM nursing while 8.33% of nurses qualification is P.B.B.Sc nursing. There is a significant association of pre-test score with educational qualification of samples, *t*-value is 2.92.

There is highly significant association of pre-test score with previous participation in program related to biomedical waste management of samples.

Supportive studies also revealed that 90.6% of nursing personnel desired to have training on biomedical waste management. A similar study also showed that only 3% of nurses had received training on biomedical waste management.

This explains that greater emphasis was not given for training the health-care professionals on biomedical waste management, as education in the safer working routine is extremely essential to avoid risks and hazards related to biomedical waste.

Similar study conducted by Jyoti Srivastava on knowledge regarding biomedical waste management among the staff nurses showed that the staff nurses had average knowledge regarding biomedical waste management. The planned teaching program was found effective because post-test knowledge was better than the pre-test knowledge score among staff nurses.[6]

Similar study conducted by Mr. Alin Thomas Cherian on effectiveness of structured teaching program on knowledge regarding biomedical waste management among nursing students shows that the mean post-test knowledge score (20.6) was higher than the pre-test score (10.92) and the calculated *t*-value (12.48) was also greater than the table value (2.008) at 0.005 level of significance. The study revealed that the structured teaching program was effective in improving the management of biomedical waste in the hospitals.[7]

Similarly, one of the studies conducted at Maharashtra highlighted that due to environmental and economic

Table 3: Comparative true response by the samples of various attributes and improvement in response during post- test period

Q. No.	*n*	Pre-test score A	Post-test score B	Difference between pre- and post-test (B–A)	d^2
1.	60	28	56	28	784
2.	60	17	54	37	1396
3.	60	40	60	20	400
4.	60	35	58	23	529
5.	60	17	49	32	1024
6.	60	30	60	30	900
7.	60	30	60	30	900
8.	60	18	57	21	441
9.	60	20	59	39	1521
10.	60	19	47	28	784
11.	60	27	52	25	625
12.	60	17	46	29	841
13.	60	21	39	18	324
14.	60	32	49	17	289
15.	60	53	60	07	049
16.	60	22	50	28	784
17.	60	39	50	11	121
18.	60	53	60	07	049
19.	60	11	42	31	961
20.	60	18	49	31	961
21.	60	21	38	17	289
22.	60	47	52	05	025
23.	60	55	59	04	016
24.	60	17	59	42	1764
25.	60	57	60	03	09

problems as well as inadequate waste management facilities hospitals were unable to follow the policies and guidelines.

Further findings with regard to the prevention against biohazards also showed that nurses had inadequate knowledge. Work done by the previous researchers also concluded that nurses had inadequate knowledge regarding universal precaution and post-exposure prophylaxis in case of sharp injuries.

In other studies, it was observed that sharp injuries mostly occurred while administering injections. In addition to this, nurse rarely used gloves during performance of activities involving high risk of exposure to blood and body fluids.

Conclusion

The findings of the study showed that the planned teaching program on biomedical waste management was effective in improving the knowledge of staff nurses.

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