

Original Research Article

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## Effect of Structured Training Program on Nursing Staff Regarding Awareness about Biomedical Waste Management in a Tertiary Care Hospital

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### ABSTRACT

The management of biomedical waste is an important issue in healthcare facilities, big and small. Appropriate knowledge regarding it is necessary to prevent its health consequences. This study was undertaken to assess the existing knowledge, attitude and practices regarding BMW management amongst nurses and to evaluate the effect of a structured training program given to them and in the process to update them about the recent guidelines. The study was conducted at a tertiary care hospital in Aurangabad (Maharashtra). A total of 181 nurses participated in the study from various wards and ICUs across the hospital. A pre-training questionnaire was given to each participant. A structured training program was conducted for all the participants. At the end of the training sessions a pre-evaluated post- training questionnaire was given to all participants. Statistical analysis was done by using MS. Excel for paired sample T Test,  $\chi^2$  (chi-square) test and percentage. There was a significant increase in knowledge about biomedical waste management after educational intervention which was statistically highly significant ( $p < 0.0001$ ). Knowledge regarding biomedical waste management among nursing staff improved substantially, post structured training program. This puts an emphasis on the need of intensive structured training programs at regular time intervals. This should be coupled with regular monitoring by concerned authorities regarding proper implementation of rules by healthcare professionals.

#### Keywords

BMW (Biomedical waste), structured training program, knowledge, nurses

#### Article Info

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### Introduction

"Bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biologicals or in health camps<sup>1</sup>. WHO reports state that 85% of hospital waste is non-hazardous whereas 10%

is infectious and 5 % is non-infectious<sup>2</sup>. The waste generation rate ranges between 0.5 and 2.0 kg /bed/ day. It is estimated that annually about 0.33 million tons of wastes are generated in India<sup>3</sup>.

Nurses form the backbone of any healthcare facility. The amount of time they spend with the patients per day is directly proportional to

the risk of exposure and the health hazards of biomedical waste. Hence they need to be regularly updated about the latest guidelines, skills and practices required for the management of this waste. They are also responsible for protecting themselves from healthcare associated infections as well as preventing risk due to biomedical waste to the other members of health team and community at large<sup>4</sup>.

This study was undertaken to assess the existing knowledge, attitude and practices regarding BMW management amongst nurses and to evaluate the effect of a structured training program given to them and in the process to update them about the recent guidelines.

### **Materials and Methods**

The study was conducted at a tertiary care hospital in Aurangabad (Maharashtra). A total of 181 nurses participated in the study from various wards and ICUs across the hospital. The purpose and type of study was explained and verbal consent was obtained from all the participants. The study was conducted in a phased manner. The participants were divided into four batches and each batch was trained on a separate day. An identical pre-tested, structured, validated; pre and post-training questionnaire was designed. Didactic lectures and slideshow were used as a means of training.

### **Assessment of knowledge, attitude, practices and pre-test phase**

A pre-training questionnaire was given to each participant. A total of 15 questions were included in the study regarding definition of BMW, disposal of certain materials into appropriate containers, capacity of BMW containers and treatment of BMW. 20 minutes of time was given to answer the questionnaire.

### **Training program and the post-test phase**

A structured training program was conducted for all the participants. Lecture sessions with power point presentation on various aspects of BMW management and treatment methods were conducted. This was followed by demonstration of disposal of different items into various colour coded bags and importance of segregation. This was followed by an interactive sessions in which participants working in various wards and ICUs raised their own practical queries and doubts regarding BMW management. These were discussed in depth. It was confirmed verbally that all the participants have understood the subject of discussion. At the end of the training sessions a pre-evaluated post- training questionnaire was given to all participants.

Both the pre and post-test questionnaire were evaluated for correct response and knowledge was assessed according to the percentage of correct responses. Identity of participants and scoring of the questionnaires were kept strictly confidential. Statistical analysis was done by using MS. Excel for paired sample T Test,  $\chi^2$  (chi-square) test and percentage.

### **Results and Discussion**

The study showed a significant increase in the performance of participants in post-test after the training as compared to pre-test. This was found to be statistically highly significant (p value 0.00050). There was a significant increase in knowledge regarding biomedical waste management guidelines, disposal of different items in appropriate colour coded bags, containers required for BMW and their capacity, and treatment of BMW. Except for the definition of Biomedical waste, all other aspects in the questionnaire showed a very high statistically significant difference in the post test results after the training as compared to pre test results.

In our study, we studied the awareness in different aspects of biomedical waste management. We found out that 89.4% of the participants were aware about the definition of biomedical waste pre-test. This percentage increased to 92.26% post training.

Around 18% participants were aware about the appropriate container required for disposal of expired drugs. This percentage increased significantly to 91% after the training program. 87% participants were aware regarding the disposal of broken glassware before training. This awareness increased to 95% after the training program. 66% participants were aware regarding disposal of cotton swabs in appropriate container before the educational intervention. Post test showed an increase in awareness to 95%. The awareness about disposal of plastic syringes increased from 56% in the pre-test to 75% in the post-test after training.

Awareness regarding disposal of gloves, needles and broken vials was good even in pre-test, 78%, 69% and 81% respectively. However, it significantly increased to 88% in the post-test after the training program. There was a lot of confusion about the disposal of left over blood bags. The awareness regarding the same in pre-test was 55%. However, this improved lot post training and discussions. The post test result came out to be 80.66%.

Interestingly, participants showed a good knowledge about the disposal of IV tubing in appropriate containers. The pre-test score itself was 95%, which further increased to 99.44% after training. 86% of the participants gave correct responses regarding disposal of placent in pre-test, which further increased to 99.44% in post-test.

Again, participants showed a good awareness about disposal of needles in appropriate containers. The correct response rate was 75%

in pre-test. They seemed to be well aware of the hazards of handling sharps and the infections associated. This aspect was again discussed in depth in the training and discussion sessions. The correct response rate post-test was 99.44%.

Participants also showed a good knowledge regarding type of waste requiring no biomedical waste container for example, tube wrappings, food, paper, water bottles, etc. the correct response rate was 94.44%. Post-test the correct response rate was 99.44%.

The participants however lacked much knowledge regarding the Biomedical waste containers as such, e.g. Capacity to which the container should be filled before disposal. The correct response rate in pre-test was 58.33%. However, it showed a big improvement to 82.87% after the training and discussion.

Regarding the last aspect included in the questionnaire, i.e., the treatment to which biomedical waste is subjected post disposal, e.g. Autoclaving, shredding, incineration, etc., the correct response rate in pre-test was 79%, which further increased to 82.87% in the post test (Table 1 and 2).

The difference in pre and post test scores is highly significant. This shows that a properly planned, structured training program will go a long way in regulating the various aspects involved in biomedical waste management.

The waste generated in the hospital as a result of various diagnostic and curative procedures poses potential health risk to care givers, patients, population and environment. When this waste is not segregated, collected, stored, transported, treated and disposed off by use of appropriate methods, it will emerge as a severe public health and environmental problem. The onus of biomedical waste management lies with the hospital occupier.

**Table.1** Analysis of the effectiveness of a structured training program (Paired samples t-test)

<b>t-Test: Paired Two Sample for Means</b>		
	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	126.9333333	164.4666667
<b>Variance</b>	1441.066667	185.2666667
<b>Observations</b>	15	15
<b>Pearson Correlation</b>	0.560071604	
<b>Hypothesized Mean Difference</b>	0	
<b>Df</b>	14	
<b>t Stat</b>	-4.491329226	
<b>P(T&lt;=t) one-tail</b>	0.000253774	
<b>t Critical one-tail</b>	1.761310115	
<b>P(T&lt;=t) two-tail</b>	0.000507548	
<b>t Critical two-tail</b>	2.144786681	

**Table.2** Awareness of nursing staff about Biomedical waste management

Sr No	Variable	Pre-test				Post test				P-value
		Aware (No.)	Aware (%)	Unaware (No.)	Unaware (%)	Aware (No.)	Aware (%)	Unaware (No.)	Unaware (%)	
1	Definition of BMW	161	89.44	20	11.04	167	92.26	14	7.73	0.2796*
2	Disposal of expired drugs in appropriate container	34	18.88	147	81.21	165	91.16	16	8.83	<0.00001
3	Disposal of broken glassware in appropriate container	157	87.22	24	13.25	172	95.02	9	4.97	0.0061
4	Disposal of cotton swabs in appropriate container	120	66.66	61	33.70	173	95.58	8	4.41	<0.00001
5	Disposal of plastic syringe in appropriate container	102	56.66	79	43.64	136	75.13	45	24.86	0.00016
6	Disposal of gloves in appropriate container	142	78.88	39	21.54	161	88.95	20	11.04	0.00685
7	Disposal of needles in appropriate container	125	69.44	56	30.93	161	88.95	20	11.04	<0.00001
8	Disposal of broken vials in appropriate container	147	81.66	34	18.78	161	88.95	20	11.04	0.0388
9	Disposal of left over blood bags in appropriate container	100	55.55	81	44.75	146	80.66	35	19.33	<0.00001
10	Disposal of iv tubing in appropriate container	171	95	10	5.52	180	99.44	1	0.55	0.0058
11	Disposal of placenta in appropriate container	155	86.11	26	14.36	180	99.44	1	0.55	<0.00001
12	Disposal of needles in appropriate container	136	75.55	45	24.86	178	98.34	3	1.65	<0.00001
13	Type of waste requiring no BMW container	170	94.44	11	6.07	180	99.44	1	0.55	0.0033
14	Treatment of BMW	79	43.88	102	56.35	155	85.63	26	14.36	<0.00001
15	% to which BMW container has to be filled before disposal	105	58.33	76	41.98	150	82.87	31	17.12	<0.00001
	*statistically not significant									

It is very important that hospital staff has correct information and awareness about biomedical waste management. It is also necessary to update this knowledge from time to time regarding the upcoming and recent guidelines.

It is very important that nurses are trained in a proper manner regarding waste disposal practices. In our study, we studied the awareness in different aspects of Biomedical waste management. 89.4% participants were aware about the definition of biomedical waste. This percentage increased to 92.26% post training. This might be attributable to previous trainings held in the campus. Correct knowledge regarding the segregation of expired drugs was not found in the participants. So the future training programs must focus on segregation of expired drugs.

Awareness regarding the disposal of broken glassware was already high which further increased to 95% after the training program. 66% participants were aware regarding disposal of cotton swabs in appropriate container before the educational intervention. This is in contrast to a study conducted by Sharma *et al.*, which showed this awareness rate to be just 34.7%<sup>5</sup>.

Awareness was lacking in disposal of plastic syringes in participants i.e. 56% which increased to 75% after training. Plastic syringes form a huge bulk of waste in any ward as well as in the labs where sampling is done. The technicians working at these labs and nurses working in wards should be trained regarding this.

Awareness regarding disposal of gloves, needles and broken vials was good even in pre-test, 78%, 69% and 81% respectively. This is in contrast to a study conducted by Sharma *et al.*, which had an awareness percentage of 17% and 26% respectively.

Broken vials were not included in their questionnaire.

There was a lot of confusion about the disposal of left over blood bags. The awareness regarding the same in pre-test was 55%. However, this improved lot post training and discussions. The post test result came out to be 80.66%. So, more emphasis can be given on disposal of left over bags in future training programs as well as various educational material display.

Most of the participants were aware about the disposal of iv tubing in appropriate containers i.e. 95%. This awareness can be attributed to frequent biomedical waste training programs in the past.

86% of the participants gave correct responses regarding disposal of placenta in pre-test, which further increased to 99.44% in post-test. In our and similar other study percentage increase in awareness about disposal of needles was 24.99 % and 5% respectively<sup>6</sup>. Correct knowledge about general waste generated in hospital is 94.44 % among the nurses.

The participants however lacked much knowledge regarding the biomedical waste containers as such, e.g. Capacity to which the container should be filled before disposal. The correct response rate in pre-test was 58.33%. However; it showed a big improvement to 82.87% after the training and discussion.

Regarding the last aspect included in the questionnaire, i.e., the treatment to which Biomedical waste is subjected post disposal, e.g. Autoclaving, shredding, incineration, etc., the correct response rate in pre-test was 79%, which further increased to 82.87% in the post test. The present study revealed that all the participants had a significant increase in scores in knowledge test score which was

done after training session on the subject as compared to that before the training session. The awareness level got improved after the training and discussion sessions, which clearly indicates the effectiveness of a structured training program.

In present study, the difference between the Pre and Post test scores is highly significant this shows that a structured training program on Biomedical Waste Management is very effective and necessary for the proper management of biomedical waste.

In a study conducted by Shishir Basarkar, *et al.*, hospital employees had better scores in knowledge test score which was done after training session on the subject. As evident the awareness level got improved after the training which clearly indicates the effectiveness of structured training to study participants<sup>7</sup>.

In another study conducted by Manish Patidar *et al.*, which was conducted with the nursing staff as participants, the pre-test and post-test results again showed a significant difference after an educational intervention program was conducted. The study concluded that a structured teaching program is an effective tool to improve the knowledge of staff nurses regarding bio-medical waste management<sup>4</sup>.

A study conducted by El Sayed *et al.*, at Sudan, found a highly significant improvement of nursing and sanitation staff knowledge total score regarding Biomedical waste management immediately after implementation of an educational intervention program and also after three months<sup>8</sup>.

The limitation of our study was that our study was limited to only a certain group of healthcare workers (nurses). We did not include doctors, residents and class 4 staff who also contributes towards biomedical

waste disposal. Future studies should aim at taking an overall view from all groups of healthcare workers and conduct structured teaching programs for all.

In this study, we found that knowledge regarding biomedical waste management among nursing staff improved substantially post the structured training program. This puts an emphasis on the need of intensive structured training programs at regular time intervals. All healthcare personnel must be repeatedly trained to update them regarding proper management of BMW. The healthcare workers get sensitized as a result of such training programs. This should be coupled with regular monitoring by concerned authorities regarding proper implementation of rules by healthcare professionals so that all hazardous waste is disposed off properly and any adverse effects arising out of the same are prevented. The safe and effective management of biomedical waste is a social responsibility and should not be neglected.

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