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Effectiveness of 'Training Programme' on Knowledge and Practices of Biomedical Waste Management among Health Care Workers

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ABSTRACT

A quantitative evaluative approach with pre-experimental one group pre-test post-test design was used to in present study. The study was conducted at obstetrics unit of selected Hospital of Dehradun, Uttarakhand. Biomedical waste management practices were observed on forty health care staffs. 'Training Program' on practices of biomedical waste management was intervened and post-test practice score was observed.

The study results showed that the mean pre-test score for bio medical waste management was 56%. The pre-test unit facilities compliance related to bio medical waste management was 48% respectively. The maximum pre-test practice score was observed in collection related practice (68.6%), followed by storage (52.5%), safe disposal of sharp (42.7%) and segregation (40%). The lowest practice compliance observed was related to transportation (28%). The mean post-test knowledge score (M±SD) regarding biomedical waste management was significantly ($p<0.001$) higher than that of mean pre-test score. (M±SD)

The mean post-test practice score regarding unit facilities of biomedical waste management was significantly ($p<0.001$) higher than that of mean pre-test score. The mean post-test practice score (M±SD) regarding biomedical waste management was significantly ($p<0.001$) higher than that of mean pre-test score (M±SD). There was a significant association between practice score (BMWM) and duty shift. The mean practice score during morning and evening were significantly higher than that of practice score during night shift.

Key words: Practice, Biomedical waste management, Training Programme

INTRODUCTION

According to Biomedical Waste (Management and Handling) Rules, 1998 of India, "Any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals is considered biomedical waste management. [1]

Preventing Infection and promoting health of people is the ultimate goal in every health care setting. Management of waste produced during health care is an integral part of hospital hygiene and infection control. Unsolicited constituents waste is considered as a reservoir of pathogenic microorganisms, which may source contamination and surge in infection rates. [2] The source of transmission of microorganisms can be by any means such as direct contact, in the air, or by a variety of routes. Contagious waste contributes to the risk of nosocomial infections, which puts health of people coming for care and people involved in the care, at risk. [3,4]

Daily chores like wound dressings, surgical operations, invasive diagnostic procedures in health care system give rise to a lot of waste of biological nature and if not handled with caution, it can be potential sources of transmission of infection, such as hepatitis B &C, HIV, and tetanus. In Indian hospitals approximately 1.-30-1.45 kg waste is generated per patient per day which is as high as 4.5 kg in developed countries. [5] According to western statistics, approximately 15-20% of this total waste is

hazardous, which is disposed. Whereas in Indian scenario the rates would be much higher because of improper waste segregation and waste disposal. [6]

World Health Organization stated that 85% of hospital wastes are harmless, whereas 10% is infectious and 5% are non-infectious but they are included in hazardous wastes. About 15% to 35% of Hospital waste is regulated as infectious waste. [7]

All hospitals, clinics, nursing homes, community health centers, primary health centers, butchery and research laboratory need to ensure safe disposal and environmentally sound management of waste. [6] It is the responsibility of head of the health care facility is to safeguard the health of workers involved in handling, transportation, and disposal of biomedical waste besides ensuring safety to the community and environment. [8]

MATERIALS AND METHODS

A quantitative evaluative approach with pre-experimental one group pre-test post-test design was used in present study. The study was conducted at obstetrics unit of selected Hospital of Dehradun, Uttarakhand. Total of 72 (36pre-test + 36post test) biomedical waste management practices were observed on forty health care staffs in twelve days pretest and twelve days post intervention. Non participatory observations were made in three shifts including Morning, Afternoon, and evenings. The self-made observational check list was developed by researcher and Demographic Performa was used to collect the data. Tool validity and reliably was done. Inter-rater reliability showed r = 0.9.

Biomedical Waste Management Pre-test and post-test Practice Observations N=40

TASK	MORNING		EVENING		NIGHT		TOTAL
	Pre test	Post test	Pre test	Post test	Pre test	Post test	
BMW	12	12	12	12	12	12	**72**

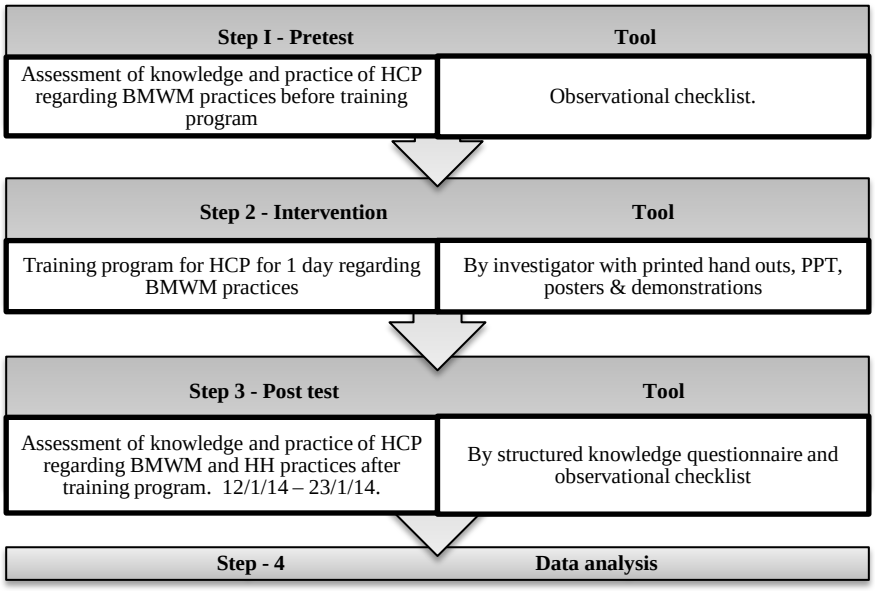

Figure No. 1: Data Collection process

Sampling technique used to select the participants for practice was Event sampling. Investigator personally observed all the events in the ward as per the duty roster planned. Events for BMWM-Facilities and placement of BMW equipment's in the unit. [One time per day for 12 days] and Biomedical waste Collection, Segregation, transportation, Storage and safe disposal of sharps were

observed. Timing for practice observations were: Morning shift: 7am-9am, Evening shift: 3pm-5pm, Night shift: 8pm-10pm. Ethical clearance was taken before data collection and written informed consent was obtained from the study participants.

RESULTS

Section I: Description of socio demographic characteristics of study participants

Table no. 1 illustrates the socio demographic characteristics of study participants. There were 40 participants out of which 17 were GNM qualified nurses (42.5%); five B.Sc. qualified Nurses (12.5%), 12 ward ayas (30.0%), Four Housekeeping staff (10.0%) and two ANM (5.0%). The mean age of the participants was 34.78±10.5 years and ranges between 23 and 60 years. The mean experience in profession was 9.9 ± 8.2 years and the mean experience in obstetric unit was 4.6 ± 4.3 years. Most (95%) of the participants were females.

Table No. 1: Description of socio demographic characteristics of study participants (N=40)

S. No.	Sample characteristics	Frequency	Percentage
1.	**Gender**		
	• Female	38	95.0
	• Male	2	5.0
2.	**Qualification**		
	• GNM	17	42.5
	• B.Sc. Nsg	5	12.5
	• Ward Attendant	12	30.0
	• House Keeping	4	10.0
	• ANM	2	5.0

Section – II: Analysis based on objectives of the study

Table No.2: Description of pre-test knowledge score of biomedical waste management by mean, SD, range and compliance. (N=40)

S. No.	Area of knowledge	Maximum possible score	Mean ± SD	Range	Mean %
1	BMWM	15	8.4 ± 2.4	3 -13	56%

The data presented in table no.2 illustrates the pre-test score of the study participants regarding hand hygiene and biomedical waste management. The mean pre-test knowledge score regarding bio medical waste management (BMWM) was 8.42 ± 2 and the score ranged between three and thirteen. The mean knowledge percentage regarding bio medical waste management was 56%.

Table No.3: Pre-test practice scores related to unit facilities by mean, SD, range and compliance (N= 12)

S. No.	Facilities	Maximum possible score	Mean ± SD	Range	Compliance percentage
1	BMWM	10	4.8±1.0	3 - 6	48%

The data presented in table no.3 illustrates the pre-test practice score regarding the biomedical waste management related to unit facilities. The score was obtained on unit facilities in regard to BMWM. Unit facilities were assessed once a day for 12 days, hence n=12.

The mean pre-test practice score of unit facilities regarding bio medical waste management was 4.8±1.0 and score ranged between three and six. The unit facilities compliance was computed by dividing the obtained practice score on unit facilities by the number of items (10) and multiplying the result by 100. The unit facilities compliance related to bio medical waste management was 54% and 48% respectively.

Table No. 4: Distribution of pre-test practice score on biomedical waste management by mean, SD, range and compliance. (N= 36)

S.NO	Area of practice	Maximum Possible Score	Mean ± SD	Range	Compliance%
1	Over all	25	11.17±2.5	6 – 15	44.6%
1.1	Collection	3	2.06±0.6	1 – 3	68.6%
1.2	Segregation	2	0.8±0.5	0 -2	40%
1.3	Transportation	5	1.4±1.18	0 – 4	28%
1.4	Storage	4	2.1±0.9	1 – 4	52.5%
1.5	Safe disposal of sharp	11	4.7±1.5	2 – 8	42.7%

The data presented in table no. 4 illustrates the pre-test practice score of participants regarding biomedical waste management. The mean practice score regarding bio medical waste management was 11.17±2.5 and the score ranged between six and fifteen. The practice score was divided and analyzed under five domains i.e. Collection (3 items), Segregation (2 items), Transportation (5 items), Storage (4 items) and safe disposal of sharps (11 items).

The mean, SD, range and compliance related to each area is illustrated in table no. 4. The maximum practice was found in collection related practice (68.6%), followed by storage (52.5%), safe disposal of sharp (42.7%) and segregation (40%). The lowest practice compliance observed was related to transportation (28%)

Table No.5 : Comparison of mean pre-test and post-test knowledge score of biomedical waste management. (N= 40)

Area of knowledge	Pre test Mean ± SD	Post test Mean ± SD	MD ± SD	95% confidence interval of the difference		't' value	p value
				Lower	Upper		
BMWM	8.4 ± 2.4	12.8 ± 1.9	4.4 ± 1.9	3.7	5.0	14.1	< 0.001
Paired sample 't' test was used, t = 2.02 at df = 39 at the level of p < 0.05 * significant							

The data presented in table no.5 compares the mean pre-test and post-test knowledge score of participants regarding biomedical waste management. The mean post-test knowledge scores regarding bio medical waste management was 12.8±1.9 and the mean pre-test knowledge score regarding bio medical waste management was 8.4±2.4. The mean difference between post-test and pre-test knowledge score regarding bio medical waste management was 4.4±1.9.

The calculated 't' value 14.1 was higher than that of the tabulated value of 2.023 at 0.05 level of significance (df =39). Hence significant improvement in knowledge score can be attributed to the training program administered to the subjects between pre-test and post-test regarding bio medical waste management.

Comparison of mean pre-test and post-test practice score on Biomedical waste management

Table No. 6: Comparisons of pre-test and post-test practice score of bio medical waste management (N=36)

S. No.	Area of Practice	Max. Possible Score	Pre test Mean ± SD	Post test Mean ± SD	Mean Difference	't' value	P value
1	**BMWM**	25	11.1±2.5	22.3±2.4	11.2	19.0	<0.001
*Independent 't' test was used t = 2.02 at df = 34 at the level of p < 0.05 * significant							

The data presented in table no.6 illustrates the mean difference between post-test and pre-test practice score (11.20. The calculated 't' value 19.0 was higher than that of the tabulated value of 2.02 at 0.05 level of significance (df=34). Hence it can be inferred that the significant improvement in practice score can be attributed to the training program administered to the subject between pre-test and post-test.

Table No.7: Comparisons of pre-test and post-test practice score of bio medical waste management. (N= 36)

S. No.	Area of Practice	No. of items	Pre test		Post test		Z score	P* value
			Mean ± SD	Mean rank	Mean ± SD	Mean rank		
1	**Collection**	3	2.06±.68	24.99	2.8±.42	48.01	5.2	<0.001
2	**Segregation**	2	0.89±.53	24.03	1.7±.45	48.97	5.6	<0.001
3	**Transportation**	5	1.49±1.1	26.97	3.3±2.1	48.97	3.9	<0.001
4	**Storage**	4	2.1±.91	21.44	3.6±.48	50.15	6.1	<0.001
5	**Safe disposal of sharps**	11	4.8±1.5	18.50	10.8±.37	54.50	6.1	<0.001
*Non parametric, Mann Whitney 'U' test								

The data presented in table no.7 illustrates the comparison of pre-test and post-test practice score of participants regarding different aspect of bio medical waste management. The pre-test and post-test score was compared using non

parametric, Mann Whitney 'U' test as the data were not found to be normally distributed.

The practice score regarding BMWM in all the areas (Collection, segregation, transportation, storage and safe disposal of sharps) have significantly improved ($p<0.001$) from pre- test to post test. Item wise analysis of pre-test and post-test practice score of study participants related to hand hygiene and biomedical waste management was performed and presented in table no. 8

Table no. 8: Improvement of BMWM practices related to unit facilities after intervention N=12

S.NO	Facilities and placement of BMWM equipments in the area.	Compliance (f)		Effect size (Post test–pre test)
		Pre test	Post test	
4.1	Biomedical waste bins are kept in each ward with color code	8	11	3
4.2	Written instruction for waste management is available in the unit.	12	12	0
4.3	There is clinical waste signage (posters) identifying waste segregation available in all areas.	12	12	0
4.4	Clinical waste sacks are labeled and secured before disposal.	10	11	2
4.5	All plastic waste sacks are fully enclosed within bins to minimize the risk of injury.	11	11	0
4.6	All waste bins are with proper cover, lidded and in good working order.	6	12	6
4.7	All waste bins are visibly clean – externally and internally.	12	12	0
4.8	All clinical waste containers are kept secured and inaccessible to the public.	7	10	3
4.9	There is no storage of inappropriate items in the waste compound.	2	6	4
4.10	The waste compound is kept clean and tidy.	2	10	8

Table 9: Compliance (F) of pre test and post test BMWM practice related to collection, segregation, transportation and storage. (N= 36)

S.NO	BMWM PRACTICES	Compliance (f)		Effect size (post test – pre test)
		Pre test	Post test	
5	**Collection**			
5.1	Waste are collected twice in a day	35	35	0
5.2	There is no emptying of clinical waste from one bag to another.	17	33	16
5.3	There are no overfilled bags. Bags are no more than ⅔ full.	22	35	13
6	**Segregation**			
6.1	There is evidence that staff is are segregating waste correctly.	28	36	8
6.2	Hazardous and offensive waste is segregated from other waste for transportation.	4	26	22
7	**Transportation**			
7.1	Waste bags are transported in a waste cart	24	26	2
7.2	No leakage from the bags	10	26	16
7.3	Top of Waste bags are tied promptly.	14	24	10
7.4	Waste bags are transported under supervision of trained staff.	4	21	17
7.5	Hazardous and offensive waste is transported separately.	3	23	20
8	**Storage**			
8.1	The waste storage area is clean and tidy.	23	26	3
8.2	No storage of waste in corridors or in other inappropriate areas inside/outside the facility	21	36	15
8.3	Storage area is free from pests and vermin.	14	35	21
8.4	Bins are stored safely, away from the public and out of reach of children.	18	33	15

Table no.10: Compliance (F) of pre test and post test BMWM practice related to Safe disposal of sharps. (N = 36)

S.NO	Safe handling and disposal of sharps	Pre test	Post test	Effect size (Post test – pre test)
9.1	Bins have not been filled above the fill line.	27	36	9
9.2	Bins are free from protruding sharps.	25	36	11
9.3	Once full the bin aperture is locked.	21	36	15
9.4	Sealed and locked bins are stored in a locked room, cupboard or container, away from public areas.	10	36	26
9.5	An empty bin is available on the emergency trolley.	14	36	22
9.6	Sharp bins are available in the medication trolley.	19	36	17
9.7	Sharps trays with integral sharps bins are available for use.	18	36	18
9.8	Sharps trays in use are visibly clean.	7	30	23
9.9	Sharps are disposed off directly into a sharp bin at the point of use (i.e. medicine trolleys)	14	36	22
9.10	Inappropriate re-sheathing of needles does not occur	8	36	28
9.11	Needles and syringes are discarded into a sharps bin as one unit.	9	36	27

Data presented in table no. 9 illustrates the Item wise practice score of study participants regarding collection, segregation, transportation and storage. Collection of waste twice a day was already in routine practice so there was no scope or need for improvement. Rest of the items in the checklist have improved from pre-test to post-test from a minimum 2 point increase in waste bags transported in a waste cart to a maximum of 22 point increase in segregation of hazardous and offensive waste from other waste for transportation.

Data presented in table no. 10 illustrates the Item wise practice score of study participants regarding BMWM related to safe disposal of sharps. Maximum improvement was observed in item no. 9.10. Followed by 9.11 with effect size of 28 and 27 respectively.

Table No.11: Comparison of means of pre-test knowledge score regarding BMWM of study participants based on their qualification. (N=40)

Qualification	Mean± SD	'F' Value	p value
B.Sc Nsg. (n= 5)	9.6±0.5	3.4	0.17
GNM (n=17)	9.1±2.2		
ANM (n = 2)	7.5±0.7		
Ward Aya (n= 12)	7.9±2.7		
HK staff (n= 4)	5.0±1.4		

* One way ANOVA was used, t = 2.09 at (df_1= 39: df_2= 4) at the level of p < 0.05 *significant.

The data presented in table no.11 compares the means of pre-test knowledge score regarding BMWM of study participants based on qualification. One way ANOVA was used to compare mean scores of staff with different educational qualification (i.e. B.Sc. Nursing, GNM, ANM, Ward ayas, and Housekeeping staff). The 'F' value found to be 3.4 p value 0.17. Hence the null hypothesis was not rejected. Therefore there was no significant association between pre-test knowledge score of BMWM and professional qualifications.

DISCUSSION

In the present study, the mean percentage of pre-test knowledge score of study participants regarding the Infection control strategies related to biomedical waste management, it was 56%. The findings revealed that pretest practice regarding unit facilities compliance related to biomedical waste management was 48% respectively. Both the knowledge and practice score (mean %) regarding BMWM was found to be four poor to average (Ranged from 44% to 56%).

Similar findings were reported in the study done by Nagaraju B through a quantitative descriptive survey conducted in the all PHCs of Bagepalli Taluk in Karnataka state. Study shows that the majority of subjects 79 (65%) had average knowledge, and 63 (53%) had average practice. The findings of present study were also congruent with the findings of Mahadeo B et al. from Karad which revealed that the majority of nursing staff and students had poor attitudes with regard to hand hygiene.

The present study shows that the maximum practice score was found in collection related practice (68.6%), followed by storage (52.5%), safe disposal of sharp (42.7%) and segregation (40%). The lowest practice compliance observed was related to transportation (28%). A cross-sectional study conducted by Vanesh Mathur among health care workers revealed that the sanitary staff was ignorant about the practices related to biomedical waste management. The study also emphasized on training regarding biomedical waste management, lack of proper and complete knowledge about biomedical waste management impacts and practices of appropriate waste disposal.

Present study revealed that the training program on infection control strategies significantly improved the knowledge and practice score regarding hand hygiene and in biomedical waste management. Several earlier studies reported that there was significant improvement in knowledge and practice regarding infection control practice after a training Programme.

A study with a pre-test post-test design carried out by Erkan T. et al. reported that there was significant increase

in the frequency of hand washing by the nurses (P <0.05) together with an increase in the time allowed for hand washing (P <0.05), knowledge of hand washing practices and quality. Similar findings were revealed by Schmitz et al through a before-and-after assessment of health care worker (HCW) adherence with WHO hand hygiene guidelines. Study revealed that there was a significant increase in hand hygiene adherence among HCWs following implementation of a WHO multimodal hand hygiene program. Adherence increased from 2.1% at baseline to 12.7% after the implementation of the hand hygiene campaign.

Experimental study conducted by Veera M. and Sai K reports that there was improvement in practices related BMWM after implementation of training program. The findings are in congruence with the present study.

The present study found that there was a significant association between practice score (BMWM) and duty shift (F=7.2; p=0.002). The mean practice score during morning and evening was significantly higher than that of practice score during night shift. Hence it was concluded that, morning and evening shift had better practice regarding BMWM than night shift.

Implications:

Nursing Education and Practice

- Educating healthcare workers regarding infection control and reinforcing it from time to time will help improve the standards of practice related to infection control.
- An Infection control nurse and ward in charge can utilize the teaching program in the ward to enhance the knowledge and practice of staff related to biomedical waste management.

Nursing administration and management

- The nurse In-charge should make sure that a written local staff-agreed policy is in place in the ward for biomedical waste management practices. Proper orientation to the policy and protocol should be given to all the staff at the time of induction.
- The nurse In-charge should make sure those practice protocols are displayed in the appropriate places.
- The nurse administrator should make sure that the physical facilities related to BMWM are in place in every shift.
- Proper supervision and auditing of facilities and practices may help in improving the practice standards.

Nursing research

- Surprise auditing of practices of health workers regarding infection control practices may reflect the current practice standard and expose the lacuna in such practices.
- Evaluation of practices will provide valuable data which will be helpful to improve the practice

Recommendations:

- A similar study may be replicated on a large sample covering the entire nursing personnel who are working in a labor room and all the procedures related to infection control can be observed
- A true experimental study may be carried out with a control group.
- The study can be extended to find out the effectiveness of a training Programme/guidelines on rate of infection in patients (patient prognosis or HAI as an outcome variable)
- Infrastructure of units can be modified for proper storage and disposal of waste.

CONCLUSION

The segregation of waste at source is the key step and reduction, reuse and recycling should be considered in an appropriate standpoint. The study concluded that practice deficit existed in all the area of Infection Control Strategies among health care personnel working in the obstetric unit. The study in terms of training program on hand hygiene and biomedical waste management was found to be effective in enhancing the knowledge and practice of health care personnel on hand hygiene and biomedical waste management. The

findings of the study suggest that periodic training on infection control strategies is necessary to enhance the knowledge and practice of health care personnel working in the obstetric unit. The challenge is to scientifically achieve emergent quantities of biomedical waste that go beyond past practices. To protect the environment and health of community, sensitization on this issue is obligatory.

REFERENCES

1. Singh R., Mathur R.G., Mandal K., Puri S. The role of information booklet on biomedical waste management for nurses. Nursing J India. 2000;148:271-72.
2. Govt. of India, Ministry of Environment and Forests Gazette notification No 460 dated July 27, New Delhi: 1998: 10-20.
3. Shinde M.B., Mohite V.R. A Study to Assess Knowledge, Attitude and Practices of Five Moments of Hand Hygiene among Nursing Staff and Students at a Tertiary Care Hospital at Karad. International Journal of Science and Research 2014;2(3) 311-319.
4. Erkan T, Findik UY, Tokuc B. Hand-washing behavior and nurses' knowledge after a training programme. Int J Nurs Pract. 2011; 17(5):464-9.
5. Schmitz et al. Effectiveness of a multimodal hand hygiene campaign and obstacles to success in Addis Ababa, Ethiopia: Antimicrobial Resistance and Infection Control. 2014,3(8):3-8.
6. Veera M.P., Kumar K.S. Impact of training on bio medical waste management - a study and analysis. excel international journal of multidisciplinary management. 2012;6 (2).1-3.
7. Glenn, Mc.R & Garwal, R. Clinical waste in Developing Countries. An analysis with a Case Study of India, and a Critique of the Basle TWG Guidelines (1999).
8. Mathur P, Patan S, Shobhawat S. Need of Biomedical Waste Management System in Hospitals - An Emerging issue - A Review. Current World Environ 2012;7(1):117-124. Available from: http://www.cwejournal.org/?p=1969

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