

## Effectiveness of planned teaching programme regarding awareness of biomedical waste management, among paramedical & sanitary staff in hospitals of Ujjain city.

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### Abstract

**Background:** Almost 80% of health care waste is comparable to domestic waste; the remaining approximately 20% is considered hazardous, as it may be infectious, toxic and/or radioactive. Infectious and anatomic wastes together represent most of the hazardous waste, up to 15% of the total waste from healthcare activities. Developed countries generate on an average up to 0.5 kg of hazardous waste per bed per day; Whereas developing countries generate on an average 0.2 kg of hazardous waste per hospital bed per day & this figure for India is 0.33 million ton biomedical waste per year, mounting to 1-2 kg per day per bed. Improper management of biomedical waste poses a significant hazardous risk to the patients, healthcare workers, the community and environment. Based on the review of the literature and the observation, we concluded that there is a need to educate the health team members regarding biomedical waste management as an effective strategy to improve the prevailing health care. **Aim:** To find out the effectiveness of planned teaching programme regarding awareness of biomedical waste management, among paramedical staff in hospitals of Ujjain city by comparison of pre & post-intervention data. **Material and methods:** An Interventional study was carried out among paramedical (Nursing staff & lab technicians) & sanitary staff of Government and private hospitals of Ujjain city from 1<sup>st</sup> January 2013 to 30<sup>th</sup> November 2013. Total sample size 400 was taken. Study subjects were selected by the convenience sampling method. A self-administered semi-structured questionnaire based on previously developed validated tools was used to collect the information. Data were collected through personal interviews. Statistical analysis was done by SPSS 16.0 and chi-square test. **Results:** Pre-test mean knowledge, attitude & practice score among study participants regarding biomedical waste management was found  $15.74 \pm 3.20$  (mean  $\pm$  SD) out of the total score of 28. Post-test mean score was increased up to  $20.49 \pm 3.05$  (mean  $\pm$  SD). The difference between pre-test and post-test scores was found very highly significant ( $t = -29.893$ ,  $P = 0.000$ ). It reveals that training programme regarding biomedical waste management was very effective in improving the knowledge, attitude & practice of the study participants. **Conclusion & Recommendations:** The results of this study had demonstrated a lack of awareness of most aspects of BMW management among study participants before training, very encouraging results were observed after the training programme as the highly significant improvement was observed in knowledge, attitude & practice of the study participants towards the most aspects of biomedical waste management. This study recommends periodic training workshop on BMW to reinforce and update knowledge of hospital employees regarding BMW management.

**Keywords:** Bio-medical waste management, paramedical staff, knowledge

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### Introduction

Health institutions are committed to providing health

care services, and during the process of providing health care services and eliminating potential risks to people's health, they produce wastes which refer to remains or by-products of human production and consumption processes. Almost 80% of health care waste is comparable to domestic waste; the remaining approximately 20% is considered hazardous, as it may

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be infectious, toxic and/or radioactive. Infectious and anatomic wastes together represent the majority of the hazardous waste, up to 15% of the total waste from healthcare activities. Sharps represent about 1% of the total waste, but they are a major source of disease transmission if not properly managed. Chemicals and pharmaceuticals account for about 3% of waste from healthcare activities while genotoxic waste, radioactive matter and heavy metal content account for around 1% of the total healthcare waste[1]. Developed countries generate on an average up to 0.5 kg of hazardous waste per bed per day; Whereas developing countries generate on an average 0.2 kg of hazardous waste per hospital bed per day & this figure for India is 0.33 million ton biomedical waste per year, mounting to 1-2 kg per day per bed[2,3]. Improper management of biomedical waste poses a significant hazardous risk to the patients, healthcare workers, the community and environment[4]. Healthcare waste has been caused 21 million hepatitis B virus (HBV) infections (32% of all new infections); 2 million hepatitis C virus (HCV) infections (40% of all new cases); 260,000 HIV infections (5% of all new cases) in 2000. Epidemiological studies indicate that a person who experiences one needle stick 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[5]. Several studies have been revealed that lack of awareness regarding biomedical waste management among health care workers is a common problem and these studies recommended that there is a need to conduct periodic training, retraining workshop and regular follow up for proper biomedical waste management[6-8]. Based on the review of the literature and the observation, we concluded that there is a need to educate the health team members regarding biomedical waste management as an effective strategy to improve the prevailing health care. So in the present study, we have designed and implemented a structured training programme to improve the knowledge, attitude & practices of nursing staff, lab technicians, and sanitary staff regarding biomedical waste management & find out the effectiveness of this training programme by comparison of pre & post-intervention data.

### **Aim and objectives**

To find out the effectiveness of a training programme to improve the knowledge, attitude and practices of nursing staff, lab technicians and sanitary staff in hospitals of Ujjain city regarding biomedical waste management.

### **Material and methods**

The present study was intervention study (before & after) by design, conducted between January to November 2013 in the Government and private hospitals of Ujjain city to find out the effectiveness of a training programme to improve the knowledge, attitude and practices of nursing staff, lab technicians and sanitary staff in hospitals of Ujjain city regarding biomedical waste management. The sample size was calculated by the formula  $N = 4PQ/L^2$  where P (Anticipated population Prevalence) was 35%, <sup>(9,10)</sup> Q (100-P) was 65%; L (absolute precision) was 5% & at 95% confidence interval, minimum sample size 364 has been derived, which is rounded off to the next highest number & final sample size of 400 was Calculated. The study was started after the approval from the ethical & research guidance committee of the institute. Permissions for the study were obtained from the medical director/medical superintendent of concerned hospital. Study subjects (nursing staff, lab technicians, and sanitary staff) were selected by the convenience sampling method from the list of the employee in concerned hospital record, those given written consent & working since last six month enrolled for the study. Out of the total 30 hospitals of the Ujjain city, six hospitals (two government hospitals and four private hospitals) were selected using a convenience sampling method. A self-administered semi-structured questionnaire based on previously developed validated tools was used to collect the information. Questionnaire modified as per the biomedical waste management & handling rule 1998. A pilot study was conducted other than the study subjects to validate the questionnaire. Questionnaires were checked for completeness and correctness before entering into the worksheet. This modified questionnaire was translated and back translated in the Hindi language. The information was collected from nursing staff, lab technicians, and sanitary staff using both English and Hindi version of the questionnaire. The questionnaire was divided into two parts, A and B. Part A Includes background variable like age, sex, educational level, income, designation and previous training regarding biomedical waste management. Part B containing questions for types of biomedical waste, Storage, segregation, transport, disposal & hazards of biomedical waste.

### **Data were collected in three steps**

#### **Step-1 (Pre-test data collection)**

Before the intervention, the data was collected based on a self-administered, semi-structured questionnaire for the assessment of the baseline knowledge, attitude, and practices of the study participants regarding

biomedical waste management through personal interviews.

### Step-2 (Training programme on biomedical waste)

Training programme regarding biomedical waste management was organized for the two consecutive days in the form of lectures on proper biomedical waste management, printed material (module and information brochure) & demonstration on proper biomedical waste management.

### Step-3 (Post-test data collection)

Post-intervention data were collected using the same self-administered semi-structured questionnaire to

assess the effectiveness of the training programme through personal interviews.

Data analysis was done as per the objectives stated for the study by using statistical software SPSS 16.0 version. Data were analyzed using appropriate statistical methods (Percentage, mean, and standard deviation for quantitative data analysis,  $\chi^2$  test for categorical data analysis & paired t-test for the pre and post-intervention data analysis). For all the tests, a 'p' value of less than 0.05 is considered as statistical significance.

## Results

**Table 1: Demographic Feature Of The Study Participants**

Background Variable	Male	Female	Total
<b>Age</b>			
<30years	86(34.1%)	166(65.9%)	252(63%)
>30years	40(27.0%)	108(73.0%)	148(37%)
<b>Education</b>			
Below 12 <sup>th</sup> Class	74(28.1%)	189(71.9%)	263(65.8%)
12 <sup>th</sup> Class & Above	52(38.0%)	85(62.0%)	137(34.2%)
<b>Previous Training</b>			
Trained	76(29.8%)	179(70.2%)	255(63.8%)
Untrained	50(34.5%)	95(65.5%)	145(36.2%)
<b>Job Distribution</b>			
Nurses	44(17.1%)	214(82.9%)	258(64.5%)
Lab Technicians	55(69.6%)	24(30.4%)	79(19.8%)
Sanitary Workers	27(42.9%)	36(57.1%)	63(15.8%)
<b>Working Period</b>			
6 Months -2 Years	41(29.1%)	100(70.9%)	141(35.2%)
> 2 Year	85(32.8%)	174(67.2%)	259(64.8%)
<b>Total</b>	126(31.5%)	274(68.5%)	400(100%)

Table-1 shows that Out of the 400 study participants, 274(68.5%) were female & 126(31.5%) were male. Mean age of the study participants were found 31.36(SD=11.62) years with 63.0% participants below the age of 30 years and 37% study participants above the age of 30 years. 65.8% were educated below higher secondary (12th class). 63.7% of study participants were previously trained in biomedical waste management. Majority of the study participants were the nurses (64.5%) and 64.7% of the study participants working in the concerned hospital for more than 2 years.

### Main findings of the result

Knowledge regarding personal protective measures among study participants is increased by 28% after the training programme. This improvement was found

statistically significant  $\chi^2$  (df) =72.36(1), p=0.000. Knowledge regarding hazards of biomedical waste was increased by 27% after training this improvement was found statistically significant  $\chi^2$ (df)=58.8(1),p=0.000. Knowledge of the study participants regarding colour coding of biomedical waste was increased by 12% after training, and this improvement was found statistically significant  $\chi^2$ (df)=11.53(1),p=0.000. Knowledge regarding infectious waste was increased by 7.8% after training. This improvement was found statistically significant  $\chi^2$  (df) =13.91(1), p=0.000. After training, there was a negligible improvement (1.7%) in the knowledge of the study participants regarding the disposal of biomedical waste. This improvement was not found statistically significant  $\chi^2$  (df) =0.25(1), p=0.671. The attitude of the study participants towards

segregation of biomedical waste was found improved by 41.5% after training this improvement was found statistically significant  $\chi^2(df)=126.24(1), p=0.000$ . Attitude towards and proper handling of biomedical waste were found to be increased by 28.8% after training, and this improvement was found statistically significant  $\chi^2(df)=69.73(1), p=0.000$ . Attitude towards personal protective measures was found to be increased by 1.2% after training, and this improvement was not found to be statistically significant  $\chi^2(df)=0.61(1), p=0.434$ . Practice towards hand hygiene was found increased by 25.7% after training. This improvement was found to be statistically significant  $\chi^2(df)=50.60(1), p=0.000$ . Practice towards reporting accidental injuries improved by 23.0% after training.

This improvement was found to be statistically significant  $\chi^2(df)=44.79(1), p=0.000$ . Practice towards personal protective measures was found improved by 3.4% after training. This improvement was not found to be statistically significant  $\chi^2(df)=1.16(1), p=0.281$ .

#### **Comparison of knowledge, attitude & practice of study participants before and after training programme.**

A total of twenty-eight questions and statements were included for analysis of the knowledge, attitude & practice of study participants (each correct response carry score one), so the comparison of knowledge, attitude & practice of study participants before and after the training programme was done from the total score twenty-eight.

**Table 2: Comparison of knowledge, attitude & practice of study participants before and after training programme.**

	Mean knowledge, attitude and practice score (SD) Total score=28	df	Paired t	p-value
Before training	15.74(3.20)	399	-29.893	0.000
After training	20.49(3.05)	399		

Table-2 shows that pre-test mean knowledge, attitude & practice score among study participants regarding biomedical waste management was found  $15.74 \pm 3.20$  (mean  $\pm$  SD) out of the total score of 28 & Post-test, mean score was increased up to  $20.49 \pm 3.05$  (mean  $\pm$  SD). The difference between pre-test and post-test knowledge, attitude & practice scores were found very highly significant ( $t = -29.893, P = 0.000$ ), It reveals that training programme regarding biomedical waste management was very effective in improving the knowledge, attitude & practice of the study participants.

#### **Discussion**

Distribution of sample according to their age shows that majority (63.0%) of the study participants belongs to the age of fewer than 30 years with a mean age of  $31.36 (\pm 11.62)$  years. Similar age distribution found in the study by Assadullah Md et al[11] where the mean age of the study participants was found  $28.6 (\pm 9.04)$  years, & most (72.9%) of the respondents were under the age of 30 years. The majority (68.5%) of the study participants under study were females, and 31.5% were male. A similar distribution was found in the study by Ozder et al[12] where 67.5% of the study participants were female, and 32.5% were male. In the study by Shafee M et al.[13] where 59.8% of the study

participants were female & 40.2% were male & in the study by Assadullah Md et al[11] 96.4% of respondents were female and 3.6% were male. Distribution of sample according to their educational background shows that majority (65.8%) of the study participants had education below the class 12th, and only 34.2% of the study participants educated above the class 12th. In a study by Bansal M et al. (14) 68.6% of study participants had completed post-graduate education, and the rest 31.4% were undergraduates. With regard to the previous exposure to the training program related to biomedical waste management, 63.8% of the study participants had received special training on biomedical waste management. Exposure to previous training among study participants higher as compared to study by Nandana et al[7] & Kende V et al[15] where 33.33% & 40% of the study participants respectively had a previous exposure related to biomedical waste management and lower to the study by Assadullah et al. where 77.7% of the study participants had received previous training on biomedical waste management. Distribution of study participants according to their job shows that majority (64.5%) of the study participants were nurses, followed by lab technicians (19.8%) and sanitary workers (15.8%). In a study by Shafee M et al[13] 47.4% of the study participants were nurses, 26.4% were lab technicians, and 26.2% were

housekeeping staff. In another study by Ismail, Imaad Mohammed, et al[16] four groups of participants, doctors, nurses, lab-technicians and class-IV waste handlers were taken, and each group had an equal number of study participants (25% in each group). Similar four groups were also taken by Mathur V et al.<sup>(17)</sup> in their study, majority of study participants (64.8%) had work experience in the medical field for more than 2 years, and 35.2% of study participants had work experience less than 2 years. In the study by Assadullah et al[11] 54.2% of the study participants had work experience in the medical field for more than 3 years, and 45.8% had had work experience of less than 3 years. Pre-test knowledge, attitude and practice of the study participants on biomedical waste management was determined by assessing the level of knowledge, attitude and practice scores and analyzing the item-wise analysis of correct response.

A training programme was conducted regarding biomedical waste for two days by the team of experienced faculty members. A guest faculty member was also invited & he was former nodal officer & had expertise in the field of providing training regarding biomedical waste management.

Post-intervention data were collected by the same questionnaire & analyzed to assess the effectiveness of the training programme.

The overall effectiveness of the training programme & area wise improvement among study participants were discussed below:

Correct responses regarding infectious waste were increased by 7.8% after training among study participants. Correct responses regarding personal protective measures among study participants are increased by 28% after the training programme. Negligible improvement (1.7%) was observed in the correct responses regarding disposal of biomedical waste among study participants after the training. Correct responses regarding colour coding of biomedical waste were increased by 12% after training. Correct responses regarding the hazards of biomedical waste were increased by 27% after training. The attitude of the study participants towards segregation of biomedical waste were found improved by 41.5% after training. Attitude towards and proper handling of biomedical waste were found to be increased by 28.8% after training & attitude towards personal protective measures were found to be increased by 1.2% after training. Practice towards personal protective measures was found improved by 3.4% after training. Practice towards hand hygiene was found increased by 25.7% after training & practice towards reporting accidental injuries improved by 23.0% after training.

The difference between pre-test and post-test knowledge, attitude & practice scores of the study participants was found very highly significant ( $t = -29.893$ ,  $P = 0.000$ ), It reveals that training programme regarding biomedical waste management was very effective in improving the knowledge, attitude & practice of the study participants. Similar results were observed in another interventional study by Ozder, Aclan, et al[12] A statistically significant difference was found among those who had received medical waste management training (preliminary test and final test) and others who had not ( $p < 0.01$ ).

A similar finding was also observed by Mohan, D. Rama et al[18] and Patil VG, Pokhrel A et al[19] in their study where the effectiveness of the training programme regarding biomedical waste management among study participants was observed. In our study, very highly significant improvement was observed regarding biomedical waste management after training, as compared to the study by Ozder, Aclan, et al<sup>(12)</sup>, Mohan, D. Rama et al<sup>(18)</sup> and Patil VG, Pokhrel A et al where significant improvement was observed, the possible reason of this could be the properly designed training programme regarding biomedical waste management[19]. In our study, two days training programme was conducted with lectures on different aspects of biomedical waste by a team of experienced faculty members and also by the former nodal officer (biomedical waste management), who has expertise in this field. Different modalities of teaching were adopted like a printed module, information brochure, audio-visual aid & demonstration on proper biomedical waste management. In our study post-intervention data were analyzed to assess the overall effectiveness of training programme & also according to each selected item to assess improvement in knowledge, attitude & practice of the study participants in a selected area of biomedical waste management, which was lacking in some intervention studies on this issue.

### Conclusion

The results of this study had demonstrated a lack of awareness of most aspects of BMW management among study participants before training, very encouraging results were observed after the training programme as the highly significant improvement was observed in knowledge, attitude & practice of the study participants towards the most aspects of biomedical waste management. The findings of the present study suggest that there is a need to train and educate the health care workers regarding biomedical waste management in the hospitals of Ujjain city through extensive training and retraining programmes. Furthermore, it is also suggested that a proper waste

management educational programme should be included in the curriculum for medical education so as to give due importance to this vital issue. Because the study was confined to one region of West India, further regional studies are required on a larger population to generalize the results, in the formulation and implementation of BMW guidelines. The topic is very relevant to all countries, and it is suggested that all public and private healthcare providers should audit the BMW knowledge and practices of their staff at regular intervals.

### Recommendations

This study recommends periodic training workshop on BMW to reinforce and update knowledge of hospital employees regarding BMW management. Periodical evaluation should be done by the hospital administrators to ensure adherence to the specifications of the biomedical waste (handling and management) rules by the health care personnel. Designation of the training programme should be specific for the specific group of Participants, so the training should be different for hospital administrators, doctors, and nurses, technical & non-technical staff.

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