

# Status of Biomedical Waste Management in Nursing Homes of Delhi, India

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## ABSTRACT

**Introduction:** Improper management of biomedical waste (BMW) poses a risk for health and environment. Healthcare workers have an important responsibility to properly segregate and train the staff in its disposal.

**Objective:** To study the awareness, attitude and practices of health care workers in biomedical waste management and to observe the appropriateness of the same in the private nursing homes in Delhi, India.

**Materials and Methods:** A cross-sectional study was conducted among private nursing homes in Delhi. In both south and east zones, 116 nursing homes were selected by random sampling method. Data was collected using a validated questionnaire of WHO. Data was analysed using SPSS software (version 16). Chi-square or fisher tests were used and accepted statistically significant if p-value was less than 0.05.

**Results:** 41.7% of the workers in south zone and 25% in east zone had no knowledge about BMW generation ( $\chi^2=24.26$ ,  $p=0.001$ ). 57 (95%) workers in south zone and 55 (98.2%) in east zone agreed strongly that BMW management is helpful in reducing spread diseases in the community ( $\chi^2=1.22$ ,  $p=0.5$ ). On observation, it was found that 13 (21.7%) nursing homes in south zone and 15 (26.8%) in east zone did not have black bags. Practice of biomedical waste management in nursing homes in both the zones of Delhi was poor.

**Conclusion:** The study concluded that the awareness regarding biomedical waste management was not satisfactory among health care workers in private sector. There is a need of strict implementation of guidelines of BMW management.

**Keywords:** Biomedical waste, Awareness, Practices, Delhi, Nursing Homes

## INTRODUCTION

Biomedical waste (BMW) has been defined as the “waste generated in the diagnosis, treatment or immunization of human beings or animals, in research or in the production of testing of biological products including all categories of infected and toxic waste that is potential threat to human being and environment” [1]. It is estimated that 0.33 million tonnes of hospital waste is generated in India; rate of generation of which ranges from 0.5 to 2 kg per bed per day [2]. The waste is increasing in its amount and type due to advances in scientific knowledge and has an impact on human lives [3]. Poor awareness of all categories of health workers and improper management of biomedical waste poses a risk for health and environment [4]. Beside infectivity concerns, it causes chemical and radiological hazards [5]. Aim of biomedical waste management is proper segregation, collection, transport, handling and disposal in such a way that it is safe for environment as well as community. There are a number of legislations to enforce proper disposal of BMW in India, for example Biomedical Waste (Management & Handling) Rules 1998, and Solid waste (Management & Handling) Rules 2000, Hazardous Wastes (Management & Handling) Rules 1989 [1,6,7]. These rules are applicable to every hospital and nursing home, veterinary institutions, animal houses or slaughterhouses, which generate biomedical waste. With this regard healthcare workers have an important responsibility to properly segregate and train the staff in its disposal. This paper attempts to study the awareness, attitude and practices of health care workers in BMW management and to observe the appropriateness of the same in the private nursing homes in Delhi, India.

## MATERIAL AND METHODS

This was a cross-sectional study conducted over a period of 2 months from June to July, 2012 among private nursing homes in Delhi. Directorate of Health Services (DHS) instead of Delhi

Health Secretariat. There are total of 679 private nursing homes in Delhi, India. The area is divided into four zones; east, west, north and south. Present study was carried out in two zones selected randomly, i.e., south and east zones. In the study, administrators and health staff of 679 private nursing homes situated in the east and south zones constituted the study population. Sample size was calculated on the basis of assumption that baseline knowledge about BMW management and appropriate practices to be 50%, worst acceptable to be 40%. Taking power of the study to be 80% and  $\alpha$  error 5% with 95% confidence interval, sample size was calculated using EPI-INFO software version 3.3.2. It came out to be 84. A total of 120 nursing homes were selected from 201 nursing homes situated in south and east zones by random sampling method using random number tables. Out of 112 nursing homes from south zone and 89 from east zone, 60 nursing homes from each zone were selected using random number tables. Out of 120 nursing homes, 4 in east zone refused to give consent to participate in the study. Finally, 60 nursing homes from south zone and 56 from east zones were studied.

Before starting the study, authorization letter was obtained from the DHS to visit the nursing homes and taking interview. Data was collected from the administrator and any one of the available health staff i.e. doctor, nurse or any other worker selected randomly from the nursing home. It was followed by assessing the BMW management in the nursing home by researcher by direct observation.

Data was collected using a validated questionnaire which was devised by WHO for assessment of BMW. The questionnaire consisted of three parts; one was questionnaire for administrator, second was questionnaire for health worker and third was direct observation by the researcher to assess BMW management. Questionnaire for administrator included details about the nursing home i.e. nature of health care provided, total staff, average number of daily patient load, whether the nursing home was registered under BMW management rules, if they have obtained authorization from

Delhi Pollution Control Committee (DPCC), training given to health staff about BMW management and post-exposure prophylaxis facility being provided to the workers. Data was also collected regarding effluent treatment plant availability in the nursing home, if there is hospital BMW management committee in the nursing home, personal protective equipments being given to the health staff, use of mercury based equipments and chemicals used for disinfection. Questionnaire for workers included items to assess their knowledge and attitude regarding BMW management like knowledge to dispose off different types of hospital waste in different bags and their vaccination status etc.

Questionnaire for researcher to observe BMW management included assessing appropriate location, availability, use, labelling and disposal of different bags, disposal of needles, syringes, housekeeping, disinfection and infection control practices being observed in the nursing home.

Only small nursing homes upto 50 beds were included in the study. Those refused to give consent for the study or for whom authorization letter was not given were excluded.

Data was analysed using SPSS software (version 16). Chi-square test/Fishers' Exact test were used to observe the differences between proportions. Two way tables were utilized to assess the relationship between dependent and independent variables. The results were accepted significant if p-value was less than 0.05.

All participants were explained purpose of the study and confidentiality was assured before taking interview. Written informed consent was taken from all participants before study.

## RESULTS

Out of 60 nursing homes in south zone (S), 49 (81.7%) were providing specialised health care services while 11 (18.3%) were providing general health services. In east zone (E), this figure was 45 (80.4%) and 11(19.6%) respectively which was not significant with  $\chi^2= 0.32$ ,  $df=1$ ,  $p\text{-value}=0.85$ . In south zone, 58 (96.7%) nursing homes and 51 (91.1%) nursing homes of east zone were registered under BMW management rules but rest 2 (3.3%) in south zone and 5 (8.9%) in east zone were unregistered ( $p\text{-value}=0.26$ ). In south zone, 46 (76.7%) and 39 (69.6%) of east zone nursing homes obtained authorisation from DPCC but 12 (20%) in south and 9 (16.1%) in east zone did not have authorisation while 2 (3.3%) in south and 8 (14.3%) in east zone refused to provide information on the same ( $\chi^2= 4.47$ ,  $df=2$ ,  $p\text{-value}=0.107$ ).

### Knowledge of health workers about BMW

When asked about generation of BMW, 25 (41.7%) workers in south zone and 14 (25%) in east zone had no knowledge about BMW generation. Area wise details are given in [Table/Fig-1]. There was a significant difference in knowledge about generation of BMW in two areas with ( $\chi^2= 24.26$ ,  $df=4$ ,  $p\text{-value}=0.001$ ).

When asked about disposal of general waste, 47 (78.3%)S and 48 (85.7%)E answered correctly as black bag but 8 (13.3%)S and 5 (8.9%)E had no knowledge about its disposal as shown in [Table/Fig-2]. But there was no statistically significant difference between

two areas about correct knowledge of general waste disposal ( $\chi^2= 1.06$ ,  $df=1$ ,  $p\text{-value}=0.30$ ).

### Attitude of health workers on BMW

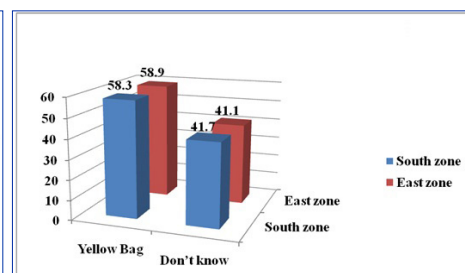
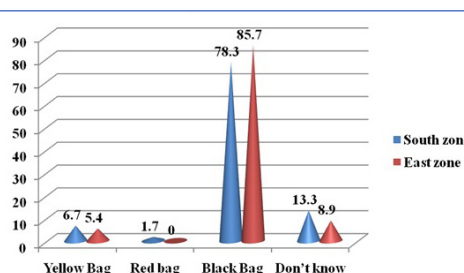
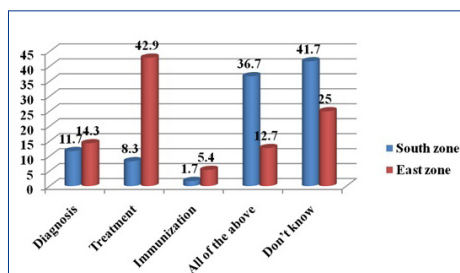
Attitude of health workers was assessed on likert scale. When asked whether gloves should be worn while handling blood and body fluids of all patients, 58 (96.7%) of south zone and 55 (98.2%) of east zone agreed strongly. When asked about their attitude on whether BMW management is helpful in reducing spread diseases in the community, 57 (95%) in south zone and 55 (98.2%) in east zone agreed strongly. In both cases, there was no difference found among two areas.

### Practices of health workers on BMW management

When asked about what they do after needle prick injury, 41 (68.3%) and 39 (69.6%) in south zone and east zone respectively replied that they used to apply antiseptic after injury while 7 (11.7%) in south zone and 8 (14.3%) in the east zone said they use to squeeze finger after needle stick injury. Keeping the finger under running water for 5 minutes was reported by 10 (16.7%) and 6 (10.7%) in south and east zone respectively. Some unhealthy practices were reported; 1 (1.8%) in east zone reported to keep finger in mouth after prick and 2 (3.3%) in south zone and 2 (3.6%) in east zone reported that they did not do anything after injury ( $\chi^2= 1.98$ ,  $df=4$ ,  $p\text{-value}=0.73$ ). When asked regarding practice to discard infected bandage, 35 (58.3%) and 33 (58.9%) in south and east zone reported correctly that they dispose it in yellow bag. This was also not statistically significant ( $\chi^2= 0.004$ ,  $df=1$ ,  $p\text{-value}=0.94$ ). But interesting to note that 40% were practicing wrong [Table/Fig-3].

When asked about training on BMW management of health workers, it was found that in 34 (56.7%) nursing homes of south zone and 29 (51.8%) of east zones, all workers had undergone training, in 20 (33.3%) nursing homes of south zone and 25 (44.6%) in east zone, some workers have undergone training while no worker received training in 6 (10%) and 2 (3.6%) in south zone and east zone nursing homes respectively which was not significant ( $\chi^2= 2.81$ ,  $df=2$ ,  $p\text{-value}=0.24$ ). Post exposure prophylaxis was provided to workers in only 6 (10%) and 10 (17.9%) nursing homes in south zone and east zone respectively ( $\chi^2= 1.50$ ,  $df=1$ ,  $p\text{-value}=0.22$ ). Effluent treatment plant for liquid waste was present in only 1 nursing home in east zone. BMW management committee was present in 21 (35%) and 22 (39.3%) of nursing homes in south and east zones respectively ( $\chi^2= 0.22$ ,  $df=1$ ,  $p\text{-value}=0.63$ ). Personal protective equipments (PPE) were available to all workers in all nursing homes except one in east zone.

Data was also collected from health workers present in nursing home at the time of visit. A total of 65 (56%) males and 51 (44%) female health workers were interviewed. It included doctors, nurses and paramedical staff present in the nursing homes. 38 (63.3%)S and equal number 38 (67.9%)E workers attended training on BMW management ( $\chi^2= 2.62$ ,  $df=1$ ,  $p\text{-value}=0.60$ ). Regarding vaccination status, 53 (88.3%) workers in south zone and 46 (82.1%) in east zone received both Tetanus and Hepatitis B vaccination, 3 (5%) in south and 3 (5.4%) in east zone received only Tetanus and only Hepatitis B



[Table/Fig-1]: Knowledge of health workers about generation of BMW \*All figures are in percentage

[Table/Fig-2]: Knowledge of health workers about disposal of general waste \*All figures are in percentage

[Table/Fig-3]: Practices of health workers to dispose infected handage \*All figures are in percentage

vaccination respectively, 1 (1.7%) in south zone and 3 (5.4%) in east zone did not received any vaccination while 1 (1.8%) worker in east zone had no information about his vaccination status.

### Observation to assess BMW management

When location of black bag was observed, it was found that in 13 (21.7%) in south zone and 15 (26.8%) in east zone did not have black bag. Bags were located at appropriate place in 41 (68.3%) and 37 (66.1%) in south zone and east zone respectively but in 6 (10%) and 4 (7.1%) in south and east zone, it was located at inappropriate place ( $\chi^2= 0.61$ ,  $df=2$ ,  $p\text{-value}=0.73$ ). Similar observation for yellow bag shows that 20 (33.3%) and 10 (17.9%) in south zone and east zone respectively did not have yellow bag. It was located appropriately in 37 (61.7%) and 39 (69.6%) and inappropriately in 3 (5%) and 7 (12.5%) in south and east zones respectively but the difference was not significant ( $\chi^2= 4.84$ ,  $df=2$ ,  $p\text{-value}=0.08$ ). When observed for syringes location for disinfection, it was found that it was located at appropriate place in 42 (70%) south zone and 29 (51.8%) east zone nursing homes which was statistically significant with  $\chi^2= 4.04$ ,  $df=1$ ,  $p\text{-value}=0.04$ .

## DISCUSSION

The study showed that a significant percentage of the subjects had no knowledge about the generation of BMW. Another study conducted by Bansal M et al., in urban and rural health facilities of Gwalior district in 2008 showed that only 32.75% medical, 25% para-medical and 3.44% non-medical workers gave correct answer regarding composition of hospital waste [8]. The study also showed that not all health care workers were aware of proper segregation of BMW and different colour coded bags. This was in consensus with findings of other reports [9,10]. More than 90% of health workers thought that proper BMW management is helpful in reducing spread diseases. This is very important finding since health care workers are directly involved in generation and segregation of BMW, their attitude towards importance of proper BMW management is important. If health care workers are not sensitized regarding BMW management, they will put themselves and the community at risk of various hazards. Another study done in three apex government hospitals of Agra by Sharma S et al., revealed that 46% waste handlers were aware of the risk involved in biomedical waste handling [11]. In another study done by Pandit NB et al., in hospital in Gujarat stated that paramedical staff has poor knowledge about diseases spread by BMW [12]. Regarding management of needle stick injuries, it was shown that a significant number of health workers used to practice wrong, like antiseptic application, putting finger in mouth etc as well as regarding disposal of BMW in appropriate colour bag. This is different from findings of a study done by Mathur V et al., among major hospitals in Allahabad city where all the health staff including doctors were disposing BMW in specified colour coded bags [13]. Only about half of the health workers underwent training about BMW management. In a study conducted by Soyam G et al., showed that 87.8% had received training regarding universal precautions

[14]. Effluent treatment plant for liquid waste was present in only one nursing home in east zone which is very less. This is in line with another study by Bansal M et al., Gwalior in which it was found that in only 1 hospital segregation of waste was appropriate and pre-treatment of waste was done in only four hospitals [15]. A good finding was that personal protective equipments were provided to all workers. This is against the findings of a study done in Karachi by Rasheed S et al., where out of eight hospitals two hospitals provided essential protective gears to its waste handlers [16].

## CONCLUSION AND RECOMMENDATION

It can be concluded that the awareness and practices regarding biomedical waste management is not satisfactory among healthcare workers in private sector. There is an urgent need for in service training for proper biomedical waste management. There is need to strictly implement the BMW management rules in private sector.

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FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: Oct 31, 2013  
Date of Peer Review: Dec 29, 2013  
Date of Acceptance: Jan 15, 2014  
Date of Publishing: Mar 15, 2014