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**Original Research Article**

# Knowledge and practice survey of biomedical waste management among health care workers in tertiary care hospital of Vijayapura district

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## ABSTRACT

**Background:** Biomedical waste is defined as any solid or liquid waste generated during diagnosis, treatment or immunisation of human beings and animals or during research that may present a threat of infections to humans. The Government of India had launched a law known as "Bio-medical Waste (Management and Handling) law 1998". To assess the knowledge level and status of current practice of biomedical waste management among health care workers of tertiary level teaching hospital.
**Methods:** Cross-sectional study was conducted among health care workers like nursing staff, laboratory technicians and class-IV workers (willing to participate). Questionaries' were asked to test the basic knowledge regarding BMW and current practices related to BMW management.
**Result:** The knowledge level of BMW management among the health workers was around 74% whereas current practice of it among them was around 73%. The knowledge and practice of BMW management was more among nursing staff followed by lab technicians and low among class-IV workers.
**Conclusion:** Despite of training in BMW management the awareness level and current practice of BMW handling appears to be less among class-IV workers who are exposed to it at very frequently and hence are at high risk of getting infections compared to others.

**Keywords:** Biomedical waste, Knowledge, Practice, Health care worker

## INTRODUCTION

Biomedical waste (BMW) is "waste generated during diagnosis, treatment or immunization of human beings or animals, or in research activities pertaining thereto, or in the production or testing of biologicals".[1] A total of 80% of the waste generated in the hospitals is composed of general waste while the remaining 20% comprises of infectious, toxic or radioactive waste. Of this, 20% of the waste is highly infectious and dangerous and could cause serious damage to the society and the environment when it is not properly segregated and disposed of.[2]

Indiscriminate disposal of BM or hospital waste and exposure to such waste poses a serious threat to the environment and to human health. BM waste requires specific treatment and management prior to its final disposal. The severity of the threat is further compounded by the high prevalence of diseases such as Human immunosuppressive virus (HIV) and hepatitis B and hepatitis C.[3-5]

There are specific guidelines for segregation and management of BMW. The law envisages schedule, requisite BMW treatment facilities such as incinerator, autoclave, microwave system for the treatment of waste, or ensure requisite treatment of waste at a common waste treatment facility or any other waste treatment facility. The Government of India had launched a law known as "Bio-medical Waste (Management and Handling) law 1998".[5,6]

Although there is increased global awareness among health care professionals about hazards and appropriate management techniques, the level of awareness in India has been found to be unsatisfactory.[2] The success of biomedical waste management programme rests on the knowledge and practice of the Health care worker (HCW).[6]

With this background a study was planned to assess the knowledge level and current practice status of biomedical waste management among health care workers of tertiary level teaching hospital.

## METHODS

A cross-sectional study was conducted among the health care workers of tertiary care teaching hospital (Al-Ameen Medical College) situated in Vijayapura district of Karnataka state in the month of January 2020.

With 95% confidence level and margin of error of ±10%, a sample size of 100 health care workers would allow the study to determine the knowledge and practice status among them. Adjusting for 10% drop out rate, recruitment target will be set at 110 subjects minimum, by using the formula:

$$n = Z^2(1-p) \div d^2$$

Where,

Z=Z statistic at 5% level of significance, d is margin of error, p is anticipated prevalence rate (50%).

After taking permission from the hospital authority, Health care workers like nursing staff, laboratory technicians and class-IV workers who were willing to participate in the study were enrolled (after giving informed consent) whereas those who were not interested to participated were excluded from the study.

Information regarding socio-demographic details, working details, knowledge and practice of management of bio-medical waste by interview method using pre-designed, semi-structured questionnaire. All the collected information was entered in the excel sheet and analyzed for frequency distribution and tests of significance to find association with variables.

## RESULTS

Total 200 health care workers were enrolled into the study after taking informed consent. Among them majority were nursing staff followed by class-IV workers and Laboratory technicians as shown in figure I.

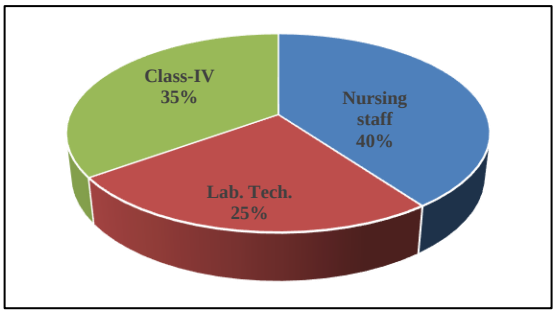


**Figure 1: Percentage distribution of category of health care workers.**

According to table 1, nearly equal distribution of the participants was present in each age group and gender. Education wise the levels were more among nursing and lab tech (compulsory requirement for the post) whereas class-IV have education level up to PUC (10%) only. Around 50% of the health care workers have experience level up to 5 to 15 years whereas 18% workers were new (<5years) and 25% were working since >15 years.

Table 2 shows that overall level of knowledge based on correct answers by the health care workers was as high as 92% (minimum 57%) whereas working category wise the knowledge regarding important aspects of BMW was high among nursing staff (minimum 63% to maximum 100%) followed by Lab. Technicians (minimum 66% to maximum 100%). The knowledge level among class-IV workers were found to be as low as zero percent to highest 64%.

Table 3 shows the current practice level of the health care workers regarding BMW management according to which, nursing staff found practicing BMW management to maximum extent (75% to 95%) followed by Lab. Technicians (66% to 96%) but the class-IV workers practice status was found low (49% to 69%). Majority of the health care workers underwent formal training in BMW management organized by the hospital at least once (nursing 100%, lab technician 96% and class-IV 91%).

Table 4 shows that significantly less knowledge questionaries' were answered correctly by class-IV workers compared to nursing and lab technicians whereas similar trend was observed with respect to practice of BMW management during their day today work.

**Table 1: Socio-demographic distribution of study participants.**

| Variables | | Nursing staff (n=80) | Lab technician (n=50) | Class-IV (n=70) | Total (n=200) |
|---|---|---|---|---|---|
| | | N (%) | N (%) | N (%) | N (%) |
| Age (in years) | 20 to 30 | 40 (50) | 10 (20) | 07 (10) | 57 (29) |
| | 31 to 40 | 16 (20) | 12 (24) | 14 (20) | 42 (21) |
| | 41 to 50 | 20 (25) | 13 (26) | 21 (30) | 54 (27) |
| | 51 to 60 | 04 (05) | 15 (30) | 28 (40) | 47 (24) |
| Gender | Male | 28 (35) | 23 (45) | 42 (60) | 93 (47) |
| | Female | 52 (65) | 27 (55) | 28 (40) | 107 (53) |
| Education | Primary | 00 (0) | 00 (0) | 03 (05) | 03 (02) |
| | High school | 00 (0) | 00 (0) | 60 (85) | 60 (30) |
| | PUC | 00 (0) | 00 (0) | 07 (10) | 07 (04) |
| | Graduate | 72 (90) | 48 (95) | 00 (0) | 120 (60) |
| | Postgraduate | 08 (10) | 02 (05) | 00 (0) | 10 (05) |
| Working since (in years) | <5years | 16 (20) | 12 (25) | 07 (10) | 35 (18) |
| | 5 to 10 | 20 (25) | 15 (30) | 14 (20) | 49 (25) |
| | 11 to 15 | 30 (37) | 04 (08) | 13 (18) | 47 (24) |
| | 15 to 20 | 06 (08) | 08 (15) | 20 (28) | 34 (17) |
| | >20 | 08(10) | 11 (22) | 16 (24) | 35 (18) |

**Table 2: Knowledge level about biomedical waste management among participants.**

| Knowledge questions | Expected answer | Nursing staff (n=80) | Lab technician (n=50) | Class-IV (n=70) | Total (n=200) |
|---|---|---|---|---|---|
| | | N (%) | N (%) | N (%) | N (%) |
| Do you know about different sources of BMW generation? | Yes | 50 (63) | 34 (68) | 30 (43) | 114 (57) |
| Do you know what the health hazards of BMW are? | HIV/hepatitis | 80 (100) | 50 (100) | 41 (59) | 171 (86) |
| Do you know about segregation of BMW at point of generation? | Yes | 70 (88) | 45 (90) | 35 (50) | 150 (75) |
| Do you know what the color-coding system for BMW are? | Red, yellow, blue, black | 75 (94) | 43 (86) | 40 (57) | 158 (79) |
| Do you know about the Biohazard symbol? | Identified correctly | 78 (98) | 46 (92) | 20 (29) | 144 (72) |
| Do you know what type of container is used for sharps? | White puncture proof | 76 (95) | 47 (94) | 36 (51) | 159 (80) |
| Personal protective measures are not necessary for handling BMW? | No | 77 (96) | 45 (90) | 45 (64) | 167 (84) |
| Do you know Proper BMW disposal is important to prevent infection transmission? | Yes | 75 (94) | 46 (92) | 40 (57) | 161 (81) |
| Do you know HIV/Hepatitis is transmitted from BMW? | Yes | 78 (98) | 48 (96) | 32 (46) | 158 (79) |
| Biomedical Waste (Management & Handling) Rules were first proposed in which year | 1998 | 50 (63) | 33 (66) | 00 (00) | 83 (92) |
| Average number of participants with positive knowledge regarding BMW management | | 71 (89%) | 44 (88) | 32 (46) | 147 (74) |

**Table 3: Current practice related to biomedical waste management among participants.**

| Practice related questions (expected answer 'YES') | Nursing staff (n=80) | Lab technician (n=50) | Class-IV (n=70) | Total (n=200) |
|---|---|---|---|---|
| | N (%) | N (%) | N (%) | N (%) |
| **Do you practice color-coding system for segregation of BMW?** | 65 (81%) | 40 (80%) | 40 (57%) | 145 (73%) |
| **Are you wearing gloves while handling BMW?** | 60 (75%) | 34 (68%) | 48 (69%) | 142 (71%) |
| **Do you close the containers of BMW after use?** | 62 (78%) | 33 (66%) | 34 (49%) | 129 (65%) |
| **Weather you have taken Vaccination for Hepatitis B or Tetanus Toxoid.** | 76 (95%) | 48 (96%) | 42 (60%) | 166 (83%) |
| **Do you wash hands with soap & water after disposal of BMW?** | 70 (88%) | 45 (90%) | 35 (50%) | 150 (75%) |
| **Average number of participants with positive practice of BMW rules** | 66 (84%) | 40 (80%) | 40 (57%) | 146 (73%) |

**Table 4: Association between knowledge and practice among health care workers.**

| BMW management | Variables | Nursing (80) | Lab technician (50) | Class-IV (70) | $X^2$ value | P value |
|---|---|---|---|---|---|---|
| **Knowledge** | Correct | 71 | 44 | 32 | 42.69 | <0.0001* |
| | Not correct | 09 | 06 | 38 | | |
| **Practice** | Correct | 66 | 40 | 40 | 15.015 | <0.0005* |
| | Not correct | 13 | 10 | 30 | | |

## DISCUSSION

Present study showed that knowledge level among nursing staff was around 89% followed by lab technicians around 88% and class-IV workers 46%. Whereas the current practice of BMW management correctly by nursing staff was found about 84% followed by lab technicians 80% and among class-IV workers 57%.

A study conducted by Basu et al in a tertiary care hospital of West Bengal to assess the knowledge and awareness about BMW management among junior doctors showed that only 29.5% had knowledge of the various methods of final disposal of BMW and only 76.4% knew about various types of colour coded bags for collection of BM waste.[7]

Sharma et al studied that there was a poor level of knowledge and awareness of biomedical waste generation hazards, legislation and management among health care personnel.[3] It was surprising that 36% of the nurses had an extremely poor knowledge of biomedical waste and just 15% of the class-IV employees had an excellent awareness of biomedical waste management practice.

Prashanth et al study showed that there is remarkable difference between the knowledge, attitude, and practices of nurses, laboratory technicians, and class IV employees regarding BMW management.[4]

Das et al observed majority (60.6%) of the study population belonged to the age group of 21-30 years.[5] About 35.8% worked for one year in the hospital, and 29.8% worked within 2-5 years. All the participants had heard about BMW management, but only 1.5% had formal training. 6.6% knew about five color coding used for segregation of waste with red, black, yellow, blue bags and white puncture proof container. 31.3% knew correct disposal of sharps. About 70.2% of respondents knew the use of gloves and mask together.

Rao et al studied the knowledge regarding general information about HCW, the mean score was statistically highest in doctors (10) followed by nursing staff (9.3) and least in housekeeping staff (7.5).[8]

Deress et al among 296 healthcare professionals studied, 168 (56.8%), 196 (66.2%) and 229 (77.4%) had adequate knowledge, favorable attitude, and adequate practice score, respectively. Regarding associated factors, MSc and MD+ (AOR: 4, 95% CI: (1.37, 149.52)), BSc holders (AOR: 2.53, 95% CI: (1.47, 4.38)), and availability of color-coded bins (AOR: 7.68, 95% CI: (3.30, 17.89)) were identified more likely to contribute for adequate knowledge, favorable attitude, and adequate practice scores, respectively.[9]

Imchen et al found total of 78% health care personnel had received training on BMW management.[10] Most of the doctors (76.2%), staff nurses (70.6%) and laboratory

technicians (72.2%) had received hepatitis B vaccination and injection TT, 76.2% doctors, 85.9% staff nurses and 69.4% laboratory technicians had received it. Multivariate logistic regression showed association between waste segregation practices and occupation status and training which was statistically significant.

Anand et al studied 305 participants (Doctors, nurses and lab technicians) among them knowledge, attitude and practices regarding biomedical waste management of class IV employees were found to be very low.[11] Knowledge regarding different BMW categories was good among doctors (91.6%) but only 72.7% nurses, 66.6% lab technicians and 25% class IV employees knew about it. Knowledge about BMW rules and regulations was least among class-IV employees (16.7%) followed by nurses (45.4%), lab technicians (40%) and doctors (70.8%).

***Limitations***

In this study knowledge and practice status was not assessed with respect to the training underwent in BMW management, as frequency of unofficial training and retraining was not available. The present study was conducted in private tertiary care level teaching hospital, could not be generalized to other levels of health care facility.

## CONCLUSION

Overall knowledge and practice of BMW management was good among health workers but specifically the class-IV it is comparatively low. Hence Continuous training sessions for all health workers with special focus on class-IV category must be arranged. Rules of biomedical waste management should be strictly implemented by the hospital authority at all levels along with constant supervision.

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