

DISSERTATION

At

QUANTZO HEALTH SERVICES

(27th February 2025- 27th May 2025)

Awareness of Hospital Staff on Biomedical Waste (BMW) Management

A Study at

QUANTZO HEALTH SERVICES

By

JUNAIT MALHOTRA

(PG/23/044)

Health Management

Under the Guidance of: Dr. NIDHI YADAV.

POST GRADUATE DIPLOMA IN HOSPITAL AND HEALTH MANAGEMENT 23-25



**INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT AND
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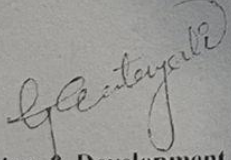
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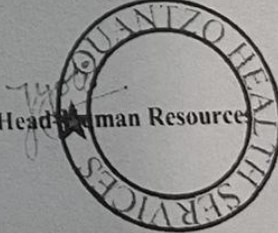
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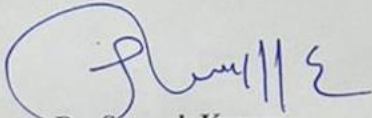

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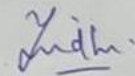
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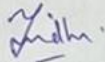
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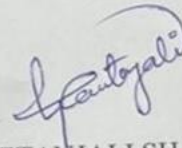
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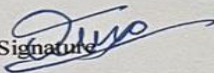


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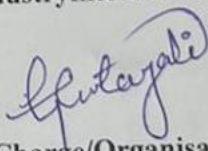
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ACKNOWLEDGEMENTS

My Institute - **International Institute of Health Management Research (IIHMR), Delhi** deserves the foremost appreciation for providing me the opportunities to understand my capabilities. I would like to thank one and all in the IIHMR team for providing me a platform for my professional career as well as for helping me boosting up all my capabilities and making me confident enough to work for health care organisations. I would like to thank **Dr. NIDHI YADAV (Associate Professor and Mentor)** for their continuous support.

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I extend my words of thanks to all the staff for always being so cooperative and facilitating me. I am extremely grateful to my parents for their love, prayers, caring and sacrifices for educating and preparing us for our future. Finally, my thanks to all the people who have supported me to complete the research work directly or indirectly.

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Abstract

Biomedical Waste (BMW) management is a critical component of healthcare operations, essential for minimizing infection risks, ensuring environmental safety, and safeguarding public health. This study assessed the level of awareness, knowledge gaps, and misconceptions regarding BMW management among staff in small healthcare facilities in Delhi. A cross-sectional survey was conducted using a validated multiple-choice questionnaire distributed to 218 participants, including doctors, nurses, dental assistants, radiographers, housekeeping staff, and administrative personnel.

The findings revealed a **mean awareness score of 7.66 (median 8, SD = 1.71)**, indicating moderate to high overall awareness of BMW management practices. High levels of knowledge were recorded in **General BMW Knowledge (89%)** and **Waste Segregation & Safety Protocols (85.2%)**, suggesting strong familiarity with basic principles and color-coded segregation systems. However, **awareness of regulatory compliance was significantly low (38%)**, highlighting confusion regarding the roles of the Central and State Pollution Control Boards and the statutory timelines for waste disposal.

The results underscore the need for **targeted regulatory training, refresher sessions, and monthly orientation programs for support staff and outsourced waste handlers**. Strengthening documentation practices and emphasizing legal accountability are also essential.

In conclusion, while staff in small healthcare facilities demonstrate moderate to high BMW awareness, **critical gaps in regulatory compliance remain**. Structured, role-specific, and interactive training programs are recommended to enhance compliance and ensure safe and effective BMW management.

INTRODUCTION

Biomedical Waste (BMW) management is a key part of healthcare operations and is important for ensuring environmental safety, reducing infection risks, and ensuring public health is protected. To ensure BMW does not pose a health risk to healthcare workers, patients, major and visitors, waste management roles are essential and involve the effective handling, segregation, storage, transportation, and safe disposal of it. Failing to manage biomedical waste as necessary could have very serious consequences, including the spread of infectious diseases, pollution of the local environment, and failure to comply with regulatory standards. While larger healthcare facilities may typically have structured waste management processes, smaller healthcare facilities face numerous obstacles to compliance with the BMW management standards. These barriers may be associated with limited financial and infrastructure resources to support BMW management processes, limited access to waste treatment technologies, limited training and education programs for staff, limited operational capabilities and fewer regulatory compliance checks. In such facilities, there could be limited awareness and adherence to BMW management processes which may lead to unsafe disposal practices for BMW and could pose a potential risk to public health. This research will assess the current level of understanding awareness, knowledge, and understanding of BMW presence BMW57 management management knowledge of the documentation previously outlined. It also aims to identify the knowledge gaps, operational gaps knowledge of mis assumptions in BMW handling practices. By undertaking this research

OBJECTIVES OF STUDY

- To assess the current level of awareness on Biomedical Waste (BMW) management among healthcare staff in small healthcare facilities.
- To identify knowledge gaps and common misconceptions in BMW handling practices.
- To provide recommendations for awareness-building and training based on the findings.

Methodology

- **Study Design:**
A cross-sectional study conducted to assess awareness of Biomedical Waste (BMW) management.
- **Study Population Includes:**
 - Doctors, Nurses, Lab Technicians
 - Radiographers, Dental Assistants
 - Housekeeping
- **Sampling Technique:**
Convenience sampling from selected small healthcare facilities located **in Delhi**, specifically those **tied up with Quantzo Consultancy**.

Data Collection Tool:

- A validated, structured multiple-choice questionnaire designed to assess:
- Knowledge of BMW categories
- Segregation and disposal protocols
- Legal and regulatory compliance
- Safety practices
- **Data Collection Method:**
Self-administered questionnaires distributed:
- **In-person** to on-site staff
- **Online**, wherever applicable, for remote participants

SAMPLE SIZE CALCULATION: QUESTIONNAIRE

- **Formula Used:**

$$n_0 = \frac{Z^2 \cdot p(1 - p)}{e^2} = \frac{(1.96)^2 \cdot 0.5 \cdot 0.5}{0.05^2} = 384.16$$

- **Finite Population Correction (N = 500):**

$$n = \frac{384.16}{1 + \frac{384.16}{500}} = 217.5$$

- **Final Sample Size = 218**

BMW Questionnaire

1. GENERAL BMW KNOWLEDGE

- **What is Biomedical Waste (BMW)?**
 - A) General office waste
 - B) Waste generated from diagnostic and treatment procedures in healthcare settings
 - C) Kitchen waste from hospitals
 - D) Non-hazardous plastic waste
- **What Personal Protective Equipment (PPE) should be worn while handling biomedical waste?**
 - A) Gloves only
 - B) Gloves and apron only
 - C) Gloves, gown, mask, and eye protection
 - D) Only mask

2. WASTE SEGREGATION AND DISPOSAL

- **Which color-coded bin is used for disposing of infectious waste, like dressings and cotton swabs?**
 - A) Yellow
 - B) Red
 - C) Blue
 - D) Black
- **Sharps such as needles and scalpels should be disposed of in:**
 - A) Blue bag
 - B) Cardboard box
 - C) Puncture-proof container
 - D) Plastic bottle
- **The red bag is used for disposing of:**
 - A) Expired medicines
 - B) Human anatomical waste
 - C) Contaminated plastic waste (IV sets, tubing)
 - D) Soiled linen
- **Cytotoxic drugs and radioactive materials should be disposed of in:**
 - A) Red bin
 - B) Black bin
 - C) Yellow bin with special labelling
 - D) Green bin
- **The correct way to handle a needle after use is:**
 - A) Recap the needle and throw it in a dustbin
 - B) Break the needle and throw it in a cardboard box
 - C) Do not recap, dispose in sharps container immediately
 - D) Wrap it in gauze and discard in black bag

3. REGULATORY COMPLIANCE

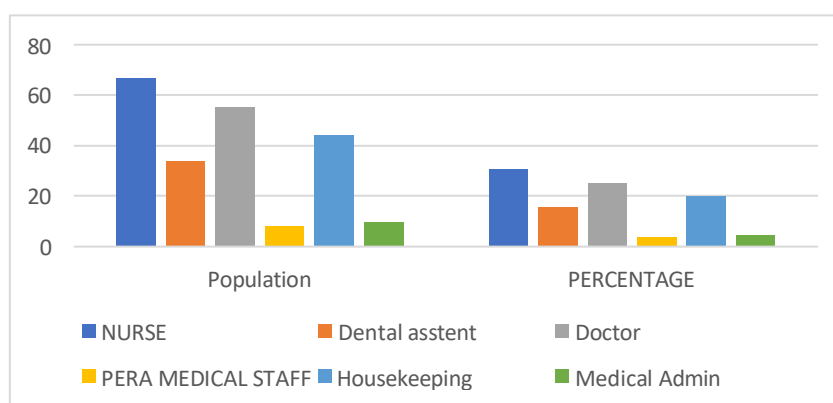
- BMW should be treated and disposed of within how many hours of generation (as per guidelines)?
 - 24 hours
 - 48 hours
 - 12 hours
 - 72 hours
- Which authority enforces biomedical waste management rules in hospitals?
 - Hospital administration
 - Central Pollution Control Board (CPCB)
 - Local Municipal Corporation
 - Health Ministry and State Pollution Control Boards

4. SAFETY PROTOCOL

- **The primary risk associated with poor biomedical waste management includes:**
 - A) Budget overrun
 - B) Environmental pollution and transmission of diseases
 - C) Staff absenteeism
 - D) Poor hospital reputation

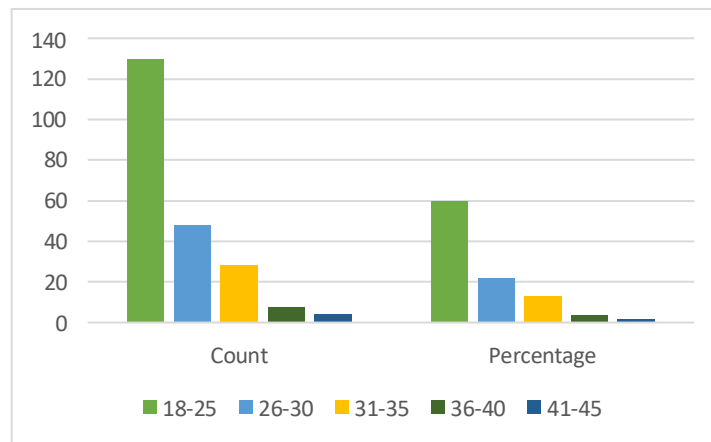
DEMOGRAPHIC VARIABLES DESIGNATION

ROLE	Population	PERCENTAGE
NURSE	67	30.7
Dental asstent	34	15.6
Doctor	55	25.2
PERA MEDICAL STAF	8	3.7
Housekeeping	44	20.2
Medical Admin	10	4.6



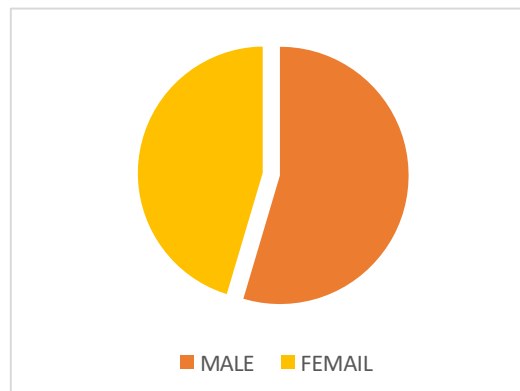
AGE

AGE	Count	Percentage
18-25	130	59.6
26-30	48	22
31-35	28	12.8
36-40	8	3.7
41-45	4	1.8



GENDER

MALE	119
FEMAIL	99



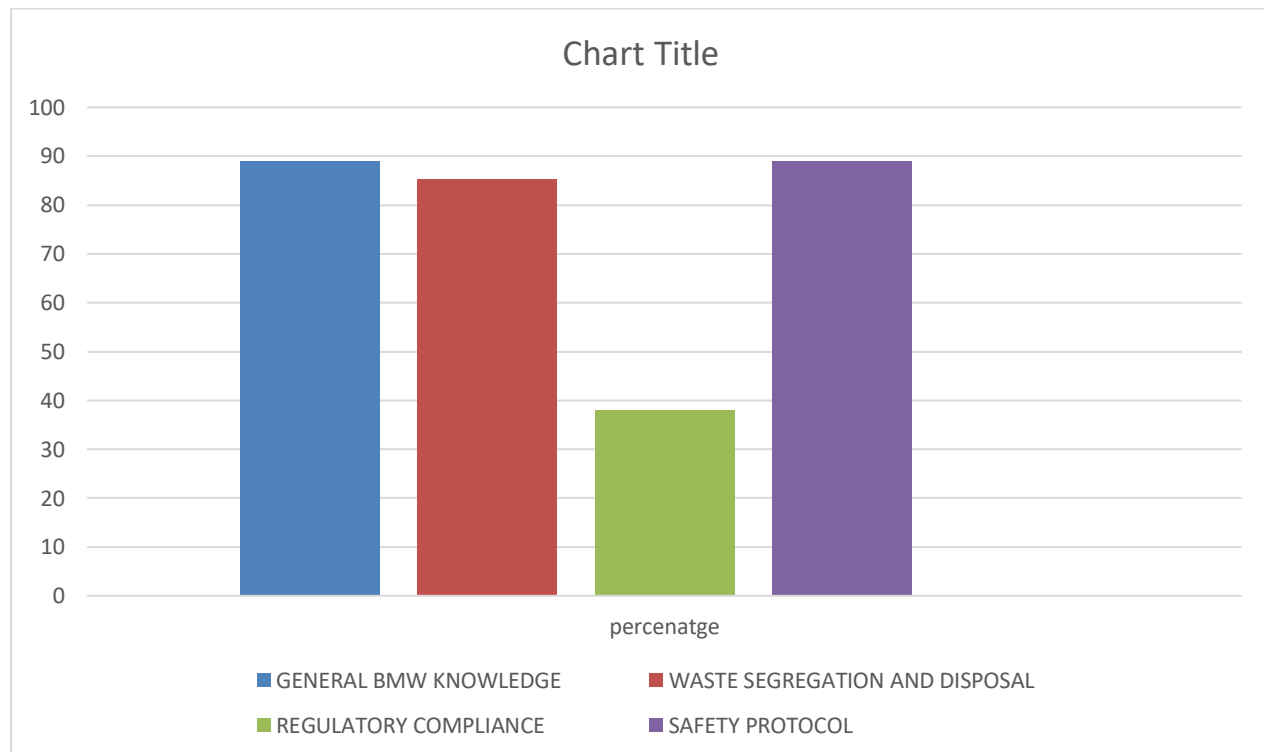
RESULT

	A
N	218
Missing	0
Mean	7.66
Median	8
Standard deviation	1.71
Minimum	3
Maximum	10

Interpretation of Results

The results of the study present a mean score of 7.66 and median score of 8 which indicates that the majority of participants had an overall moderate to high level of awareness regarding Biomedical Waste (BMW) management. The proximity of the mean value and median value indicates the scores were relatively balanced which exemplifies that participants performed on average somewhat better in their knowledge and understanding of BMW protocols. The computed standard deviation for all scores was 1.71 reflecting a moderate distribution of scores relative to the mean average. This tells us that while a large percentage of participants scored similarly to the average, both above and below the average, exhibited variation in the level of knowledge staff members possess. Other items such as previous training received, years of work experience, and responsibilities taken on at work may have also been determinant factors that contributed to the variation of scores in the study. Overall, there was a good level of awareness in general displayed by health care workers in small-scale facilities with regard to BMW management. However, the variety of scores emphasizes a need for standardized training modules and re-enforcement of BMW management guidelines.

There also needs to be a concentrated effort to ensure that housekeeping and support staff who handle waste have exposure through suitable training securities and received appropriate training as it's important for overall compliance.



Strengths: The findings provide evidence of some distinct strengths of awareness in some core factors of Biomedical Waste (BMW) management among the participants. One of the promising results is the high level of awareness in General BMW Knowledge and Safety Protocols, with 89% of the results demonstrating accurate understanding with respect to the areas. This would suggest that the staff have a solid understanding of the basic principles of BMW handling, followed by the importance of safety protocols to prevent infection and environmental impact. In addition, the participants provided good awareness in Waste Segregation and Disposal, but providing 85.2% accurate understanding. This suggests that most participants are very familiar with proper waste categorisation, colour coded segregation systems, safe disposal, etc, which is necessary to reduce the risk of contamination as well as ensuring they are operation within protocols.

Weaknesses: Nonetheless, despite the evidence of strengths, the study also presented some weaknesses that require immediate improvement. Awareness in Regulatory Compliance presented to be quite low at 38%, representing many participants did not provide clarity regarding the rules for BMW management, associated legal requirements, and the role(s) of governing bodies such as Central Pollution Control Board (CPCB) & the State Pollution Control Boards (SPCBs). This demonstrates a need to provide training focused on the documentation, reporting requirements, and timeliness of compliance, so participants can fulfil their statutory obligations.

Analysis of Questionnaires: The results of the questionnaires indicate that for the most part, most participants appeared to correctly identify the types of biomedical waste and suitable personal protective equipment (PPE) to be worn when handling and managing biomedical waste. However, there was confusion in the more technical areas, including ambiguity about authority responsibilities, documentation processes, or timelines for waste disposal. The gaps identified suggest that the knowledge base is adequate, although more specialized training is warranted to bolster knowledge of legal frameworks for waste management, documentation processes, and time-bound compliance obligations.

DISCUSSION

The results of this study indicate a moderate to high level of awareness in Biomedical Waste (BMW) management among staff employed in small healthcare organizations. Most staff scored above the median level with a mean score of 7.66/10 and a median of 8. Generally, this suggests that a majority of participants understood developed principles of BMW handling, even if scores among housekeeping and support staff were lower. The lower scores among staff indicate the need for training intervention to actively developed the BMW knowledge gap in each specific role (Singh et al. 2018).

The high awareness rates in General BMW Knowledge and Safety Protocols (both at 89%) were similar to findings from global site investigations. The WHO evidence review (2019) suggested that the influence of strong BMW Knowledge was linked to an emphasis on regular safety drills (frequency), structured training programs, and effectively communicating information in the work environment (visual communication). In addition, the good result in Waste Segregation and Disposal (85.2%) was consistent with the high rates of success reported internationally that have implemented color-coded systems of waste segregation (Pande et al. 2020). Overall, these results also align with CDC guidelines that highlight the importance of visual memory aids, standardized protocols and guidance towards practical demonstration for influencing compliance.

In contrast, the awareness of Regulatory Compliance is very low at 38% with significant confusion around the functions and roles of Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) in this area. These findings are consistent with findings of Pandit et al. (2019) who reported similar gaps in legal and procedural awareness. These findings clearly indicate the need for context-based legal awareness training with examples of practical cases and tools to support documentation to ensure comprehensive compliance.

RECOMMENDATIONS

1. Concentrate on Regulatory Training: Have sessions solely on BMW 2016 Rules, the roles and responsibility of DPCB and legal obligations, and processes surrounding documentation.
2. In any educational sessions on BMW compliance, a clear focus on the ramifications of failing to comply, and the legal standards they must adhere to.
2. Refresher Programs Regularly:
 1. Have quarterly training for all staff on the BMW types, segregation, how long until legal disposal, and if there are any new procedures to follow.
 2. Make training a little more interactive using photos, posters with colour codes, videos, and real-life scenarios.
3. Monthly Training for Third-Party/Outsourced Staff:
 1. Have monthly orientation and training sessions for any housekeeping staff, waste handlers, and anyone from Third Party personnel who interact with BMW during their duties, while also incorporating an overview of the induction process, a quick demonstration on how to identify BMW, and brief assessments of their understanding in real time.

CONCLUSION

- Individuals working in small healthcare organizations report moderate to high awareness of biological waste (BMW) management.
- A substantial gap was found in regulatory compliance for BMW management:
- Only 38% of staff had an adequate understanding of BMW rules 2016, DPCB roles, and essential legal documentation.
- Quantitative analysis (mean score 7.7/10) indicates that:
 - I. Most staff are knowledgeable about best practice BMW guidelines.
 - II. Some staff scored poorly (minimum score 3), showing a need for retraining.

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