Critical Assessment of Biomedical Waste Management Practices in Healthcare Settings - A cross sectional survey.

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Introduction

Biomedical waste (BMW) suggests off any solid, fluid, or liquid waste: including its container and intermediate products generated during the diagnosis, treatment, or immunization of humans or animals. It also comprises of the waste generated from research, biological production, testing, and animal slaughterhouses or similar facilities.[1] Research have shown that approximately 10–25% of healthcare waste is harmful and it is because BMW includes wastes of different kinds i.e. infectious, pathological, chemical, pharmaceutical, genotoxic, heavy metal, radiological and also contains sharps. These materials can lead to injury, spread infectious diseases such as HIV, Hepatitis B, and Hepatitis C, and can also harm the ecological balance.[2]

The World Health Organization (WHO) estimates that the 11 Southeast Asian countries together generate around 350,000 tonnes of healthcare waste every year. [3]Of this, about 85% is non-hazardous, while the remaining 15% is classified as hazardous meaning it may be infectious, toxic, or radioactive. Although hazardous waste makes up a smaller portion of total medical waste, poor waste handling practices that mix hazardous and non-hazardous waste together still lead to widespread contamination. [4] People exposed to biomedical waste (BMW) risk health issues and healthcare workers are most affected. It is crucial that the organizations generating BMW must ensure its safe handling for the safety and protection of human being and environment.

In 2018, the central government updated these regulations by publishing the BMW Management (Amendment) Rules, 2018, in the Indian Gazette.[5] These guidelines and protocols must be strictly followed at every stage from waste generation and collection to transportation, storage, treatment, and final disposal.[6] Key steps in proper waste management include waste surveying, segregation, accumulation, storage, transportation, pre-treatment, and disposal using appropriate methods.

Hazardous chemicals and pharmaceutical drugs pose serious risks to workers who handle waste at every level. There is also a concern that discarded drugs may be repackaged and illegally sold to unsuspecting consumers. Additionally, poor infection control and improper waste management can expose patients to hospital-acquired (nosocomial) infections. Given these risks, this study aims to: reduce the risk of disease transmission; protect the health and well-being of healthcare workers and the general public; prevent injuries and potentially fatal infections; and promote environmentally friendly waste management practices.

Material and methods

The study was carried out at a tertiary care rural hospital and a medical college. The research was carried out between August and September of 2022. It was a cross-sectional study conducted at a hospital. Among the healthcare personnel, two groups (interns and second-year medical students) were chosen, and 100 from each group were included in the survey. Group, I Interns, and Group II Second-year medical students.

The information gathered includes demographic variables and KAP for BMW handling and management.

After obtaining written informed consent, all students were individually invited to participate in the study. All study participants were guaranteed confidentiality and anonymity. The majority of the healthcare workers had been immunized against hepatitis B.

KAP was graded based on correct and incorrect responses. The data was tabulated in MS Excel, and the results were interpreted using percentages and chi-square in IBM SPSS version 23.0. Probability values of 0.005 were deemed significant.

Results

Responces comprised of Out of the 200 responses received, 186 were complete in every way. The analysis only includes 186. The majority (55%), and the remaining 45%, were females. They were all between the ages of 19 and 23.

In intern and second-year medical students, the majority, 89.60%, and 56.2%, respectively, have good knowledge of color-coded bags for BMW disposal. (Table 1) While 83.5% and 62.1% are familiar with color-coded waste bags. The interns' attitudes toward BMW management are nearly identical. 88%, 79%, and 73%, 71% of interns and second-year medical students correctly explained the practice of disinfection and treatment of BMW, respectively.

The current study found that interns know more about biomedical waste management than undergraduates. The majority of them regarded biomedical waste as dangerous. They knew that color-coded segregation was the most critical aspect of BMW management and that using a PPE kit reduces the risk of infection.

The attitudes of second-year medical students and interns toward BMW management are not statistically different. BMW management practice does not differ statistically significantly between the two groups ($p>0.05$). There is, however, a significant difference in knowledge about BMW management between these two groups ($p <0.05$). (Table 2)

Table 1: Showing knowledge, attitude, and practice responses

Questionnaire	**Domain**	**Response (%)**	
		Intern	second-year medical students
1. A correct response on color-coded bags with respective waste.	Knowledge	89.6	56.2
Knowledge about color-coded bags	Knowledge	83.5	62.1
The attitude of interns on bio-medical waste (BMW) management categorization needs	Attitude	97	95.3
BMW management necessary and reduction of health hazard	Attitude	96.4	89
Disinfecting BMW.	Practice	88	73
BMW treatment	Practice	79	71

Table 2: Knowledge of BMW management among interns and second-year medical students.

Knowledge	Intern	second-year medical students	P value
Diseases from BMW	93.2	48.7	<0.001
Colour coded bags	97.4	75.3	0.016
Steps of disposal	99.3	84.0	0.005
Biohazard symbol	94.8	67.3	0.039

Discussion

Mohan Kumar et al in his study observed that interns had good knowledge and attitude towards biomedical waste management. However, they have to be motivated, so that they can bring this into their routine practice.[7] Pandey et al in his study found that knowledge regarding the source of BMW was 86%. There is also 68% had knowledge of segregation of waste in respective color-coded bags and 88% answered that record maintenance was essential for BMW management.[8]

Sekar M et al[9] in there study showed that postgraduates were the toppers in all three determinants and laboratory technicians had better KAP values than nurses contrary to the findings of other studies.

Study done Padmaja K et al[10]found that all 100% were aware about BMW, 72% had the knowledge regarding the regular maintenance of BMW register and 93% population had the knowledge that proper segregation of BMW products.

All levels of healthcare facilities generate biomedical waste. The separation of biomedical waste at the point of generation reduces the financial costs of managing BMW and the health risks of handling these wastes. Interns outperformed second-year medical students in all three determinants, and laboratory technicians had higher KAP values than interns. The findings were consistent with those found in other studies.[11-13] Pandey et al. revealed that 68% knew waste segregation in respective color-coded bags, which is higher than the current study (53.8%).[8] Padmaja et al.[10] noticed that 100% of the population was aware of BMW, 72% were aware of the regular maintenance of the BMW register, and 93% were aware of the proper segregation of BMW products. These figures are found in the current study as well. 60% were aware of the health risks associated with BMW, according to the present study, and this knowledge was statistically higher among interns than among second-year medical students.

Rajput et al. found that staff who had received medical waste management training performed significantly better.[14]

Limitations of the study

Despite the fact that rules specify different types of bio-medical waste treatment, it is difficult to implement disposal methods at every step.

Recommendations

As much as possible, try to prevent and reduce waste generation by reusing or recycling waste. Waste should be handled safely and environmentally friendly, with final residues disposed of by landfall in confined and well-planned areas.

Conclusions

Interns have sufficient knowledge and a favorable attitude toward BMW management. However, there is still a KAP gap. This must be identified and addressed appropriately. The best way to address this gap would be to provide a training program for interns to reduce the KAP gap and, thus, the health risks associated with BMW products.

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