

**Received : 25 February 2024, Accepted: 31 March 2024**

**DOI:<https://doi.org/10.33282/rr.vx9i2.143>**

## **Knowledge about the Colour Code Segregation of Biomedical Waste in Tertiary Care Hospitals of Karachi.**

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### **Abstract**

Efficient segregation of biological waste is a crucial procedure in hospital waste management and the upkeep of a health care setting that is free from risks. Failure to accurately distinguish and separate infectious waste from non-infectious waste can result in various health and biomedical waste management problems. These problems include a significant risk of cross-contamination, a high likelihood of infection, and challenges in evaluating the generation, classification, and composition of hospital waste. This study aims to evaluate the segregation practices of health professionals at tertiary care hospitals setups in order to achieve efficient waste management. An observational and cross-sectional study was carried out on a sample of 200 individuals from four tertiary hospitals. The data were gathered by the utilisation of a pretested, structured questionnaire and real-time observation. The majority of respondents, specifically 95% individuals, expressed agreement with segregating waste at the place of generation. Additionally, most respondents also showed support for the implementation of color-coded bins to facilitate waste segregation. The survey found that the majority of the participants were aware of and actively engaged in the practice of segregating waste.

**Keywords:** Segregation, Infectious waste, contamination, waste management, tertiary care.

### Introduction

The implementation of segregation practices is crucial for achieving the reduction of hazardous wastes, efficient management of biomedical waste, and identification of medical wastes (Rahda *et al.*, 2009). Segregation is the initial step in the appropriate handling of healthcare waste. It entails the segregation of biological waste from the entirety of the trash generated in the hospital. According to the research, segregating medical waste is a crucial measure to decrease the amount of dangerous trash. This process also enables an accurate evaluation of the waste's composition by utilising color-coded bags to efficiently separate infected waste from non-infectious waste (Longe and Williams 2006). The procedure involves the segregation of various waste streams according to specific criteria, such as their nature, hazardous characteristics, treatment methods, and disposal strategies (Okechukwu *et al.*, 2022).

Segregation is a crucial aspect of effective biological waste management. It is recommended to begin segregation at the point of waste creation, namely in areas where patient care, diagnostic services, operation theatres, labour, and treatment take place. The main contributors to these biological wastes, particularly the hazardous fraction, are the doctors, nurses, chemists, laboratory scientists, technicians, and auxiliary personnel. Therefore, it is the responsibility of health personnel to effectively handle and dispose of these wastes from the moment they are created until their final disposal. As a result, inadequate segregation practices at the health facility lead to inaccurate estimation of the different types of waste. Hence, the practice of segregation serves as a valuable tool for evaluating the many waste streams produced, many of which are dangerous and necessitate specific precautions to prevent health risks (Abah and Ohimain, 2011).

The World Health Organisation (WHO) advises the separation of biological waste at the place where it is produced. Additionally, it offers instructions for the secure and efficient handling of medical waste in underdeveloped nations. The World Health Organisation (WHO) suggests using color-coded trash receptacles to make it easier to separate healthcare waste at the place where it is produced. These receptacles should be placed a few meters away from each other (WHO, 1994). By segregating wastes, a clean and well-managed solid waste stream can be created, which can be efficiently handled through recycling, and composting (NIHE, 2006). Healthcare hazardous waste should be segregated into various types and collected in appropriate containers for safe treatment and disposal. Inadequately segregated biomedical waste leads to an increase in the quantity of trash that is either treated or left untreated and transferred to landfills (Udofia *et al.*, 2015).

Implementing effective segregation practices will result in a decrease in the amount of medical waste and the associated expenses of its handling. The objective of the study was to evaluate the segregation practices among healthcare professionals in tertiary care hospitals of Karachi.

## **Methods**

A descriptive and cross-sectional study was carried out in four hospitals, with a sample size of 200 participants recruited by a random sampling approach. The hospitals were categorized into two distinct groups: private and public. Data was collected using pretested, structured, self-administered, and self-completed questionnaires. These questions required participants to provide responses on sociodemographic parameters and conventional handling practices variables, including segregation and others. The responses to the questionnaire were recorded

and processed using Microsoft Excel, version 2010. Descriptive statistics were used for the analysis of the data, and they were presented in the form of frequencies and percentages.

## Results

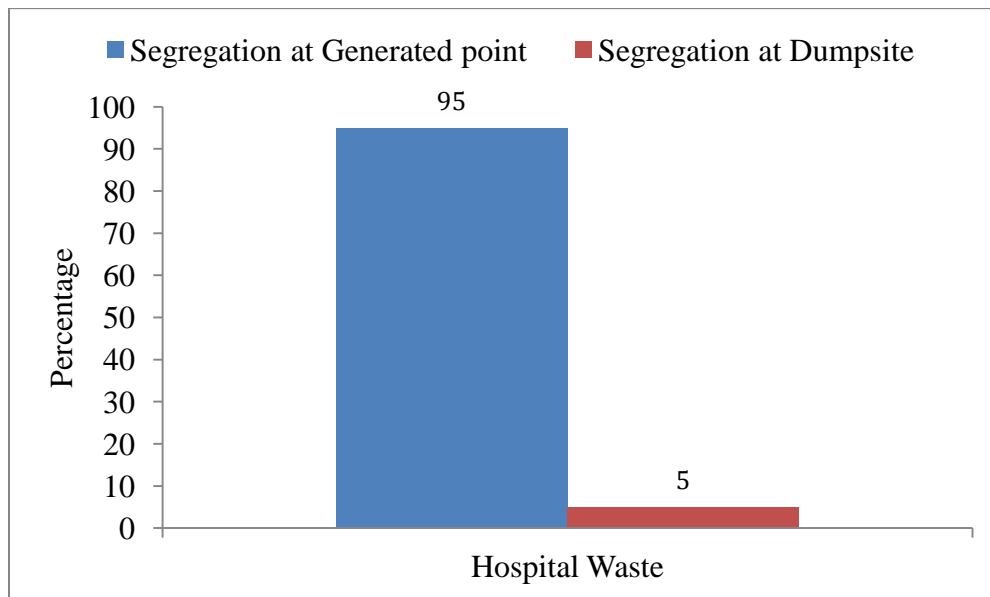
The socio-demographic parameters of the health staff in the four hospitals located in Karachi, included 88 male health workers, accounting for 44.00% of the total, and 112 female health workers, accounting for 56.00%. A total of 80 respondents, accounting for 40.00% of the sample, reported having work experience between 11 – 15 years. Out of the health personnel included in the study, the majority (38.00%) were nurses. The majority of the participants have a bachelor's degree as their greatest level of schooling (Table: 1).

**Table: 1. Demographic and Social Profiles of Respondents**

<b>Variables</b>	<b>Categories</b>	<b>Respondents</b>	<b>Percentage</b>
<b>Gender</b>	Male	88	44.00%
	Female	112	56.00%
<b>Health Professionals</b>	Doctors	42	21.00%
	Pharmacists	28	14.00%
	Nurses	76	38.00%
	Laboratory Staff	32	16.00%
	Others	22	11.00%
<b>Qualification</b>	Bachelors degree	178	89.00%
	Masters degree	16	08.00%
	Doctorate	04	02.00%
	Others	02	01.00%
<b>Years of Experience</b>	1 – 5 years	42	21.00%

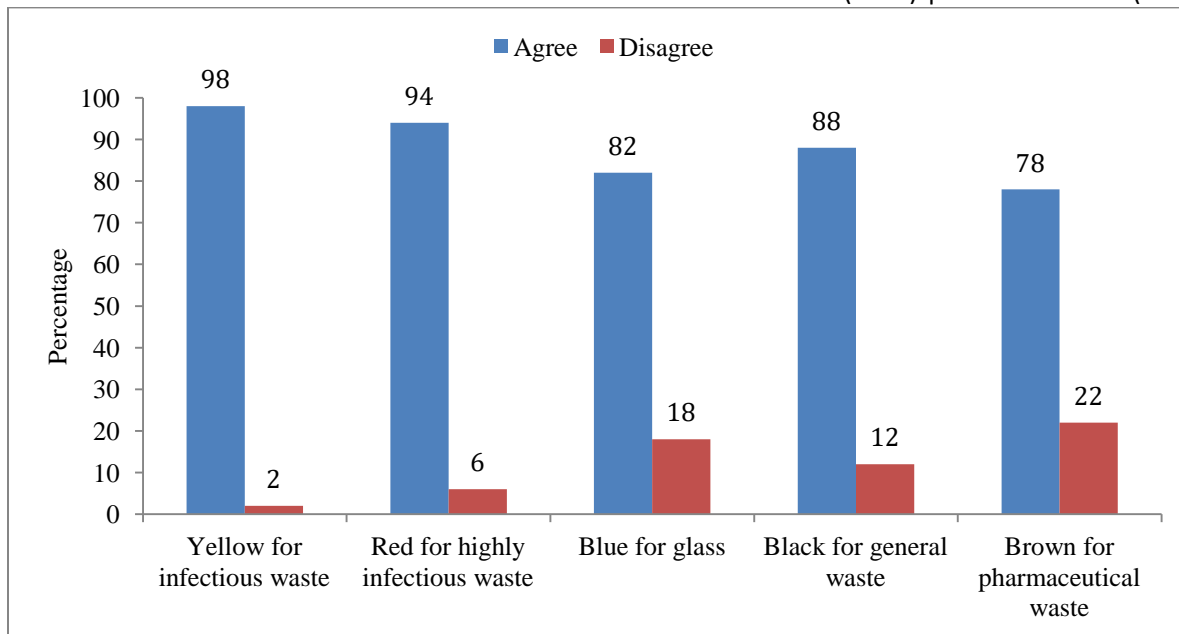
	6 – 10 years	30	15.00%
	11 – 15 years	80	40.00%
	16 – 20 years	34	17.00%
	Above 20 years	14	07.00%
<b>Type of Hospital</b>	Public	100	50.00%
	Private	100	50.00%

Out of the total, 190 individuals (95.00%) agreed to the practice of segregation at the point of generation (Figure: 1).



**Figure:1. Frequency of the Segregation of Biomedical Wastes at various Sites.**

Form the total 196 respondents (98.00%) expressed support for the use of a yellow colour-code for infectious biomedical wastes, while 188 respondents (94.00%) expressed support for the use of a red colour-code for highly infectious biomedical wastes. Additionally, the respondents also endorsed the use of other recommended colour-codes as specified by the World Health Organisation (Figure: 2).



**Figure: 2. Awareness of Colour Coding for Efficient Segregation of Biomedical Wastes.**

**Discussion**

The study findings indicated that nurses, laboratory staff, pharmacists, and doctors were mostly engaged in the practice of segregation and concurred with the findings of the previous study (Farooqi *et al.*, 2023). Nurses have a crucial role in hospitals and are extensively involved in many healthcare operations. They are particularly involved in the management of biomedical waste, which is predominantly generated in healthcare institutions. The variation in the number of health workers can be ascribed to factors such as the geographical location, timing of the study, and sampling methodologies.

This finding opposite with previous report that highlighted the respondent’s unawareness of segregation procedures in tertiary healthcare facilities (Rasheed *et al.*, 2005). This recent finding can be ascribed to the acquisition of sufficient expertise by healthcare personnel through training, as well as the utilisation of posters, job aids, and standard operating procedure (SOP) guidelines

for the identification and appropriate management of medical waste. These measures aim to decrease the overall volume of hazardous waste and reduce the expenses associated with biomedical waste management.

The study revealed that more than 90% of the participants were knowledgeable about the correct use of the color-code system. The results of this study contrast with the findings of earlier study that reported inadequate implementation of color-coding procedures (Jameel *et al.*, 2023). The difference in waste management outcomes can be linked to a lack of awareness of efficient segregation practices, inefficiencies in waste minimization measures, and insufficient funding for the provision of color-coded linings and containers. A three-bin system consisting of black, yellow, and red bins was proposed in the current study and the knowledge about the use of bins; black bin is for general waste, the yellow bin is for infectious waste, and the red bin is for extremely infectious waste was highly satisfactory.

## **Conclusion**

The study revealed that the health personnel possessed knowledge about segregation as a component of the standard operating procedures. The respondent implemented segregation at the source, employing receptacles labelled with different colours as specified by the World Health Organisation (WHO). Therefore, it seems that the responder comprehended the importance of using efficient segregation practices in order to achieve successful waste management.

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