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Nurses' Performance Regarding Waste Management Based on Occupational Safety

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Abstract

Background: Occupational safety in healthcare waste management is paramount to prevent injuries, infections, and long-term health complications among healthcare workers (HCWs). ***Aim of the study***: to assess healthcare workers' performance based on occupational safety regarding waste management by assessing the knowledge, attitude, and practice of healthcare workers regarding waste management based on occupational safety. ***Subjects and Methods***: The study was carried out at primary health care centers and governmental hospitals in Fayoum city using a cross-sectional descriptive design on 96 nurses and 34 housekeepers. The data was collected using two different versions of self-administered questionnaires and observation checklists, one for nurses and one for housekeepers. ***Results***: Only 33.3% of the nurses had satisfactory knowledge, 68.8% had positive attitudes, 61.5% had adequate reported practice and only 34.4% had adequate observed practice. Significant positive correlations were found between nurses' scores of knowledge, attitudes, reported, and observed practices. Overall, 44.1% of the housekeepers had satisfactory knowledge, 73.5% had positive attitudes, 91.2% had adequate reported practice, and 38.2% total observed practice. ***Conclusion and recommendations***: The HCWs in the study settings have deficient knowledge of waste management, with more positive attitudes and less adequate practice. The main recommends clear policies and procedures with awareness programs to make the guidelines known to all HCWs. Close monitoring and supervision are necessary, with rewards for adequate practices. Further research is proposed to investigate the effectiveness of training on HCWs' knowledge, attitudes, and practice of safe waste management.

Key words; Healthcare workers (HCWs), waste management, knowledge, attitude, practice.

Introduction

Proper waste management is crucial in healthcare settings to ensure occupational safety for healthcare workers and prevent the spread of infections. Healthcare workers play a vital role in managing healthcare waste, including segregation, handling, transportation, and disposal. The aim was to assess healthcare workers' performance in waste management based on occupational safety **Brown A, et al. (2021)**.

Healthcare workers' performance in waste management depends on their knowledge and training regarding waste segregation, handling, and disposal. Recent studies highlight the importance of comprehensive training programs that provide healthcare workers with up-to-date

information on waste management guidelines, infection control measures, and occupational safety protocols **El-Said K, et al. (2016)**. Adequate knowledge and training empower healthcare workers to effectively manage healthcare waste and minimize the risk of exposure to hazardous materials **Patel A, et al. (2019)**.

Adhering to waste management guidelines is crucial for maintaining occupational safety in healthcare settings. Recent research indicates that healthcare workers' compliance with waste management protocols varies significantly **Chen L, et al. (2022)**. Some studies have identified gaps in adherence to proper waste segregation practices, leading to potential risks for healthcare workers. Regular monitoring, feedback, and reinforcement of guidelines have been suggested to improve compliance and enhance occupational safety.

The use of appropriate personal protective equipment (PPE) is essential for healthcare workers involved in waste management activities. Recent studies emphasize the significance of proper PPE utilization to minimize the risk of exposure to hazardous waste materials. However, challenges related to PPE availability, accessibility, and compliance have been reported. Ensuring an adequate supply of PPE and promoting awareness of its correct usage are critical for optimizing occupational safety in waste management **Wilson J, et al. (2021**).

An efficient waste management system requires appropriate engineering controls and infrastructure. Recent studies have highlighted the importance of well-designed waste disposal units, segregation bins, and waste storage areas in healthcare facilities. Poor infrastructure can hinder waste management practices, leading to increased risks for healthcare workers. Investing in modern waste management infrastructure and implementing engineering controls can significantly improve occupational safety **Naidoo R, et al. (2018).**

Conducting regular risk assessments plays a crucial role in identifying potential hazards associated with waste management in healthcare settings. Recent research suggests that a proactive approach to risk assessment and mitigation is essential for safeguarding healthcare workers' occupational safety. Risk assessments should encompass various waste management stages, including collection, storage, transportation, and disposal, to effectively identify and address potential risks **Smith J, et al. (2023)**.

Continuous monitoring and evaluation of healthcare workers' performance in waste management are essential for maintaining occupational safety. Recent studies emphasize the need for robust monitoring systems to detect deviations from waste management protocols and identify areas for improvement. Regular audits, feedback mechanisms, and performance evaluations contribute to enhancing healthcare workers' performance and overall waste management effectiveness **Naidoo R, et al. (2018)**.

Healthcare workers involved in waste management may face psychological and emotional challenges due to the nature of their work. Recent research highlights the importance of providing adequate psychological support, training, and counseling services to mitigate the potential negative impacts on healthcare workers' well-being **Yang L, et al. (2020):**. Addressing mental health concerns can improve job satisfaction, reduce burnout, and enhance overall performance in waste management **Wang X, et al. (2017)**.

Significance:

Healthcare workers' performance in waste management significantly impacts occupational safety **Johnson R, et al. (2020).** Adequate knowledge and training, compliance with guidelines, proper PPE usage, well-designed infrastructure, risk assessment and mitigation, monitoring and evaluation systems, and psychological support are essential components for ensuring effective waste management and protecting healthcare workers **Williams H, et al. (2017)**. Ongoing research and implementation of best practices are crucial to continuously improve performance and occupational safety in healthcare waste management **Paudyal P, et al. (2015).**

Leadership plays a crucial role in promoting occupational safety in healthcare waste management. By integrating these leadership strategies, healthcare organizations can create a safe and supportive environment, optimize waste management practices, and prioritize the occupational safety of their workers **Li M, et al. (2018).**

AIM OF THE STUDY

This study aim is to assess nurses' performance based on occupational safety regarding waste management through:

Research questions

1. What is the nurses' level of knowledge about waste management based on occupational safety?
2. What is the nurses' level of attitude regarding waste management based on occupational safety?

SUBJECTS AND METHODS

I. TECHNICAL DESIGN

Research design

A cross-sectional descriptive research design will be used in conducting this study.

Setting: This study will be carried out at:

- Main primary health care centers in Fayoum city.
- Governmental hospitals in El-Fayoum city (Fevers and Chest Diseases Hospitals).

Subjects: All healthcare workers involved in waste management included in the study. 200 healthcare workers.

Data collection tools

Questionnaires sheet, was developed by the researcher based on pertinent literature ***(Prüss et al., 1999; MouradMilik, 2021)***.

Validity and reliability of the tools

The tools were presented to experts in Community Health Nursing to examine their face and content validity. The reliability of the attitude scale was measured by assessing its internal consistency. It showed a good degree of reliability with Cronbach's Alpha Coefficient 0.735.

ADMINISTRATIVE DESIGN

To carry out the study at the selected setting, official letters will be issued from the Dean of the Faculty of Nursing, Beni-Suef University to the hospital and centers' medical and nursing directors to get their permission to conduct the study .The purpose of the study and its procedures will be explained to them to get their agreement and cooperation. A copy of the data collection forms will be included.

Ethical considerations:

Official letters were addressed from the Dean of the Faculty of Nursing, Beni-Suef University to the hospital and centers' medical and nursing directors to obtain their permission to conduct the study. It clarified the aim of the study, and a copy of the data collection forms was attached. The study protocol was approved by the Research Ethics Committee in the Faculty of medicine, Beni-Suef University. The researcher met with the study subjects individually to explain the aim of the study and to get verbal informed consent to participate. Total confidentiality and anonymity of any obtained data were ensured.
The number of research ethics committee is: FMBSUREC/06112022/Mohamed
and date of research ethics committee: 6th November 2022

IV. Results:

Table 1: Demographic characteristics of nurses in the study sample (n=96)

	Frequency	Percent
Age:		
<30	35	36.5
30+	61	63.5
Range	22-59	
Mean±SD	38.6±12.3	
Median	37.0	
Gender:		
Male	7	7.3
Female	89	92.7
Nursing qualification:		
Diploma	68	70.8
Bachelor	28	29.2
Marital status:		
Married	82	85.4
Unmarried	14	14.6
Experience years:		
<10	36	37.5
10+	60	62.5
Range	1-41	
Mean±SD	17.8±13.6	
Median	16.0	

The sample of nurses consisted of 96 nurses whose ages ranged between 22 and 59 years, with a median of 37.0 years as presented in Table 1. The majority were females (92.7%), carrying a diploma degree in nursing (70.8%), and married (85.4%). Their median years of experience was 16.0, ranging between 1 and 41 years.

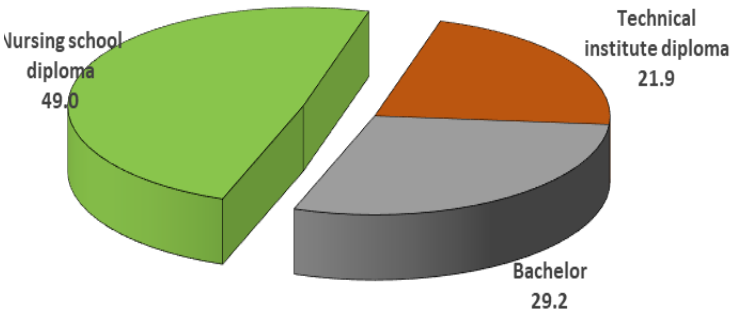

Figure1: Distribution of nurses in the study sample by nursing qualification (n=96)

Figure 1 demonstrates that almost one-half (49.0%) of the nurses in the study sample carried a secondary nursing school diploma, while 21.9% carried a technical institute diploma.

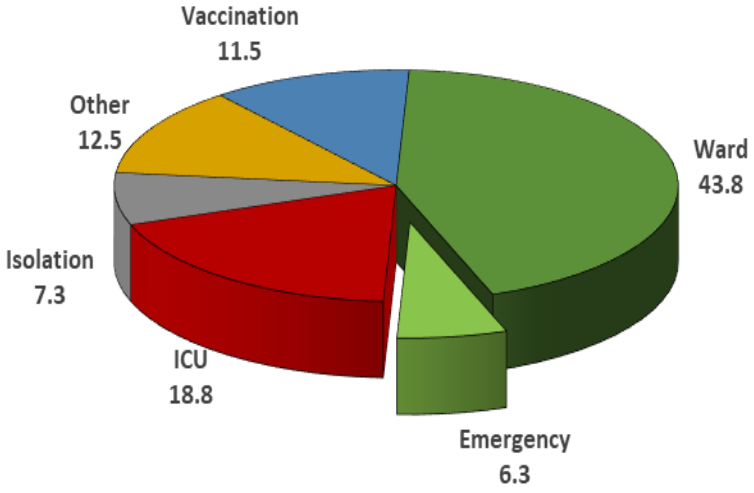

Figure 2: Distribution of nurses in the study sample by work departments (n=96)

As Figure 2 shows, the highest percentage of nurses were working in wards (43.8%), while the lowest percentage were working in emergency (6.3%)

Table 2: Nurses' awareness of hospital waste management regulations (n=96)

Hospital has:	Frequency	Percent
Waste management bylaws	68	70.8
Waste management policy	72	75.0
Waste management guidelines	63	65.6
Waste management plan	75	78.1
Waste management team	82	85.4
Special waste management procedures	83	86.5
Waste management roles in job descriptions	47	49.0

As regards the awareness of hospital waste management regulations among the nurses in the study sample, Table 2 indicates variable awareness. It ranges from 49.0% for their awareness of waste management roles in job descriptions to 86.5% for their awareness of special waste management procedures.

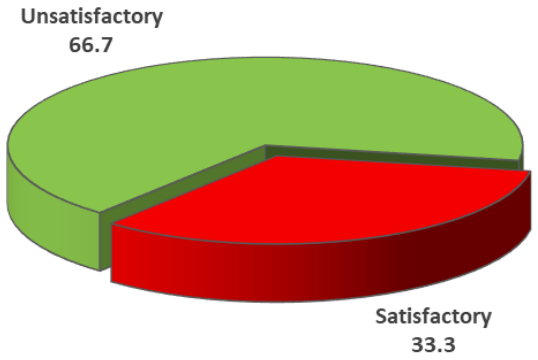

Figure 3: Nurses' knowledge of safe waste management (n=96)

As Figure 3 displays, only one-third (33.3%) of the nurses in the study sample had satisfactory total knowledge of waste management.

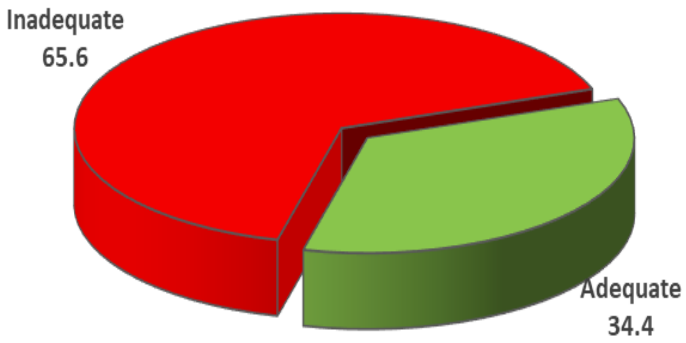

Figure 4: Total nurses' observed practice of safe waste management (n=96)

As displayed in Figure 4, only 34.4% of the nurses in the study sample had adequate total observed practice.

Table 3: Relations between nurses' knowledge of safe waste management and their personal characteristics

	Knowledge				X^2 test	p-value
	Adequate		Inadequate			
	No.	%	No.	%		
Site:						
Hospitals	24	46.2	28	53.8		
Medical centers	8	18.2	36	81.8	8.39	0.004*
Age:						
<30	18	51.4	17	48.6		
30+	14	23.0	47	77.0	8.12	0.004*
Gender:						
Male	2	28.6	5	71.4		
Female	30	33.7	59	66.3	0.08	0.78
Nursing qualification:						
Diploma	13	19.1	55	80.9		
Bachelor	19	67.9	9	32.1	21.20	<0.001*
Marital status:						
Married	24	29.3	58	70.7		
Unmarried	8	57.1	6	42.9	4.18	0.04*
Experience years:						
<10	18	50.0	18	50.0		
10+	14	23.3	46	76.7	7.20	0.007*

(*) Statistically significant at p<0.05

Table 3 points to statistically significant relations between nurses' knowledge and their work site (p=0.004), age (p=0.004), nursing qualification (p<0.001), marital status (p=0.04), and experience years (p=0.007). It is evident that the percentages of nurses with satisfactory knowledge were higher among those working in hospitals, younger age, having a bachelor's degree, unmarried, and with experience <10 years.

DISCUSSION

Worldwide, healthcare settings generate huge amounts of waste known as hospital, or more generally, biomedical waste. This includes infectious materials that may constitute a source of contamination affecting the health and wellbeing of the patients, healthcare providers, visitors, as well as the community at large, and the environment ***Deshpande et al., (2021).*** Zero-cost interventional approaches with driven education, sponsors' involvement, and provision of waste bins proved to be effective in the mitigation of the deleterious environmental effects of improper hospital waste management, along with reduction of the costs ***Dalui A., 2021).*** Improving healthcare workers knowledge can improve hospital waste management and reduce waste hazards ***(Azami-Aghdash et al., 2023)***.

The aim of this study was to assess healthcare workers' performance based on occupational safety regarding waste management. The study results revealed that the healthcare workers in the study settings, both the nurses and the housekeepers, have deficient knowledge, with slightly better attitudes. Their observed practices are quite less adequate in comparison with their reported practices.

The ages of the nurses in the present study sample covered a wide range, from the second to the fifth decades, with a correspondingly wide range of experience years. This would allow the study of the effects of these two characteristics on their knowledge, attitudes, and practices. The majority of the nurses in the present study sample were females, reflecting the still deeply rooted perception of the feminine nature of the nursing profession. The nurses' gender could also be a factor influencing their knowledge, attitudes, and practices as the study results demonstrated and discussed.

Another nurses' characteristic that could have an effect on their knowledge, attitudes, and practices was the nursing qualification. Thus, more than two-thirds of the nurses in the present study sample were carrying a diploma degree in nursing. This lower level qualification might explain the deficiencies revealed in their knowledge, attitudes, and practices. A similar association was reported in a study in Saudi Arabia ***(Mol, et al, 2022).***

Although most of the nurses in the current study reported previous attendance of training courses related to safe waste management, such training had conflicting effects on their knowledge, attitudes, and practices. Thus, on the one hand, their previous training in infection control had positive effects on their knowledge and reported practices, and their previous training in waste management had a positive effect on their observed practice. On the other hand, their attitudes were negatively affected by their previous training in waste management, and their reported practices were negatively affected by previous training in PPE. Such contradictions could be attributed to the quality of such training, as well as the nurses' willingness to get benefits from these courses. The importance of proper training in hospital waste management has been underscored in Egypt ***(Mourad (2021).***

According to the present study results, relatively high percentages of the nurses, more than one-third, reported previous exposure to needle stick injuries and nosocomial infection. This reflects a low level of occupational safety and unsafe hospital waste management, which could be attributed to their lack of knowledge, unwilling attitudes, or inadequate practices. The rate is close to the overall worldwide rate of needlestick injuries among nurses (40.97%) as reported by ***Mugabi et al., (2018),*** but is higher when compared to the rate among nurses (18.70%) ***(Isfahani et al., 2024)***.

Another important finding in the present study was the general lack of nurses' awareness of hospital waste management regulations, particularly the waste management roles in their job descriptions, as well as the waste management guidelines. This indicates the need for more efforts from the administration of the study settings in promulgating such issues related to safe waste management among healthcare workers. In congruence with this, a study in Saudi Arabia reported low rates of awareness of hospital waste management

guidelines in the study settings ***(Aljohani et al., 2023)***.

The present study assessed nurses' knowledge of safe waste management. The results revealed a wide variation in their knowledge of the different areas of waste management. Thus, almost all of them had satisfactory knowledge of the magnitude of the waste problem and safe waste disposal, reflecting their high awareness and concern about the problem. However, the results revealed major deficiencies in their knowledge of waste segregation and sources, which could have negative impacts on their practices. In line with this, a study in North Carolina (United States) demonstrated the importance of improving healthcare workers' knowledge of waste segregation and its impact on proper hospital waste management ***(Plezia et al., 2024)***.

Overall, only one-third of the nurses in the present study sample had satisfactory total knowledge of waste management. This is an alarming finding since their lack of knowledge would certainly have a negative influence on their practices, with consequent serious hazardous effects on themselves, their patients, and the community at large. In congruence with this, a cross-sectional study in the four regions of Saudi Arabia found that the surveyed healthcare professionals had a moderate level of knowledge of safe hospital waste management ***(Kordi G.,et al 2022)***.

Concerning the factors related to nurses' knowledge of safe waste management, the current study's bivariate analyses showed that the younger nurses, with fewer experience years, carrying a higher nursing qualification, unmarried, and working in hospitals had significantly more satisfactory knowledge. Moreover, the correlation analyses showed negative correlations with their age and experience years and positive correlations with their nursing qualification level. The findings are quite plausible given the effect of higher nursing qualification on knowledge, and the association between younger age and fewer years of experience with a higher nursing qualification. In fact, the strongest correlation found was between nurses' knowledge scores and their nursing qualification level. A similar significant association between the level of qualification and participants' knowledge was reported ***Yves Chartier et al., (2014).***

However, the multivariate analysis confirmed only the inverse relation between nurses' experience years and knowledge scores. In addition, this analysis demonstrated higher scores among the nurses who had previous training in infection control and those who reported a previous nosocomial infection. This could be due to the positive effect of training, and the higher need to know about safe waste management among the nurses who suffered previous nosocomial infections. The findings are in agreement with those ***(Sujon et al, 2022)***.

The present study has also measured the attitudes of the nurses toward safe waste management. The results revealed variable attitudes among them. While the majority had positive attitudes toward preventive vaccination, only around one-third had positive attitudes toward the risks of unsafe waste management. However, in total, around two-thirds of the nurses had a positive attitude toward safe waste management. Although this could be considered a positive finding, still these nurses' attitudes need improvement. A similarly high rate of positive attitudes was reported ***(Shekoohiyan, Parsaee , and GhayourS. (2020)***). Educational interventions could be effective in improving healthcare workers' attitudes towards safe hospital waste management as demonstrated in a study in Saudi ***(Thirunavukkarasu et al., 2022)***.

Regarding the factors influencing nurses' attitudes, the current study's bivariate analyses revealed that those who worked in hospitals and the unmarried had more positive attitudes. Meanwhile, the correlation analyses negative correlations with their age and experience years and positive correlations with their nursing qualification level. The multivariate analysis confirmed the positive effects of unmarried status and the negative effect of age. This could be attributed to the fact that the younger nurses who are more likely to be unmarried are more concerned about safe waste management. In line with this, an inverse effect of age was reported

Padmanabhan and Barik D. (2019).

As for the effects of training in waste management, the present study revealed a paradoxical finding. Thus, the nurses who reported previous attendance of training in safe waste disposal had more negative attitudes, indicating a worsening effect of training on their attitudes. This, as previously explained regarding the effect of training on knowledge, could be attributed to the quality of the training courses and/or the willingness of the attendants to benefit. The finding regarding the positive effect of training is in agreement with ***Nabavi-Pelesaraei et al. (2022)*** in the Ethiopian study.

Conclusion:

The main study results lead to the conclusion that the nurses in the study settings have deficient knowledge of waste management, although their attitudes are mostly positive. Their observed practices are far less adequate compared to reported practice.Their scores of knowledge and reported practice are positively correlated and influenced by their gender and previous training.

Recommendations:

The following recommendations are proposed.

- Clear policies and procedures for safe healthcare waste management should be developed, updated, and made available to all healthcare workers.
- Further research is proposed to investigate the effectiveness of training programs for healthcare workers on their knowledge, attitudes, and practice of safe waste management.

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