Assessment of Nurses Knowledge about Medical Waste Management

Hussein Hweid AL-rekabi, MSc* Ghazwan Abdulhussein Al-Abedi**

ABSTRACT

Waste management is a comprehensive process involving the collection, treatment, and disposal of waste materials, aiming to reduce their impact on the environment and human health. Assess level of nurse's knowledge towards medical waste management. Non-probability, cross-sectional "convenience" sample technique that utilized in selected (318) nurses were included in the present study to determine nurses' knowledge medical waste management at Al-Imam Al-Hussein Medical City in Kerbala City during the period 1st October 2024 to 31th July 2025. The descriptive (Frequency, Mean of Score) and inferential method (Independent Sample t-test) was use to analyze the results by SPSS 26. Most of nurses are young fall within age group of 20 – 29 years, the highest percentage refers to bachelor degree in nursing among 49.7%, that nearly half of the nurses (46.5%) demonstrated a "Fair" level of knowledge about medical waste management. While 30.8% exhibited "Good" knowledge, a concerning 22.6% displayed "Poor" knowledge. The study concluded that the study sample have a moderate level of knowledge about medical waste management.

Keywords: Nurses Knowledge, Waste Management.

INTRODUCTION

Medical waste emerges during medical procedures executed in healthcare institutions and research facilities and laboratory settings as well as at the small dispersed healthcare centers which provide treatment at home[1]. Medical waste includes a combination of municipal, pharmaceutical, laboratory, pathological, chemical, plastic, and metal materials[2]. The contamination of syringes has resulted in 21 million hepatitis B infections and 2 million hepatitis C infections and 260,000 HIV infections per year which accumulate to 32% and 40% and 5% of all new infections respectively[3]. According to WHO Healthcare waste types include three sectors of solid waste together with regulated medical waste and pharmaceutical waste as well as recyclable waste. Solid waste includes lightly contaminated or non-recyclable items. Pharmaceutical waste encompasses unused, partially used, or contaminated medications. Various factors, including socio-economic status and regulatory policies, affect medical waste management practices. While many institutions have established systems, improper segregation of waste remains a common issue[4].

Nurses face elevated chances of medical waste hazard exposure during their clinical work. Patients spend their most extended periods with nurses while in hospital care thus nurses become most susceptible to possible safety threats. Nursing staff has accountability to protect health workers and community members from waste exposure incidents[5]. Nurses function as the foundation personnel within the healthcare system because they provide direct patient care together with their involvement in hospital facilities. The healthcare staff plays an essential role in protecting health and providing treatments and preventive services and promotional services[6]. Knowledge among nurses are first key steps in developing a successful infection control program and adequate knowledge, about waste handles are key factors for having proper hazardous medical waste handlers and to protect them from exposure to potentially hazardous substances[7].

Worldwide attention must be directed at proper biomedical waste management. A proper evaluation of nurse understanding about biomedical waste management practices creates essential conditions for environmental safety and risk reduction. Currently there is a lack of research in our country regarding this issue which motivated the researchers to conduct this study[8]. The establishment of proper healthcare waste management within hospitals depends primarily on dedicated waste management teams alongside sound administration and detailed planning and organizational framework and legal statutes and sufficient financing and active participation from trained healthcare staff[9]. Nurses dedicatedly interact with patients from arrival to departure compared to all personnel in healthcare. Hospital environment hazards along with their linked risks become more extensive because of nurse exposure to biomedical waste. The latest information and skills and practice in waste management are essential tools for hospital staff to decrease hospital-acquired infections and protect their personal health. Waste management responsibilities of nurses help to reduce risks of exposure of infectious materials that would affect both healthcare staff and residents of the community[10].

The World Health Organization (WHO) identifies good healthcare waste management in a hospital as dependent on six key factors which include a dedicated waste management team with proper administration, careful planning, sound organization, underpinning legislation, adequate financing, and full participation by trained staff[9]. Patient care time in hospital wards exceeds that of all healthcare professionals since nurses remain with their patients the most. The extended amount of time nurses spend with patients in their care leads to higher hospital environmental exposure mostly from biomedical waste and related health risks. The personnel must acquire current information and proficiency in waste management practices for minimizing hospital-based infections while ensuring their personal health protection. Medical staff exposure risks to hospital waste are minimized through the actions of these staff members[10].

* Department of Community Health Nursing,
College of Nursing, University of Kerbala, Iraq.
** Assistant Professor, Department of Community Health Nursing
College of Nursing, University of Kerbala, Iraq.
Email: Ghazwan.a@uokerbala.edu.iq

A large proportion of around 10-25% healthcare waste items fall in the hazardous category thereby posing environmental pollution risks and harming human health[11]. Hospital managers alongside other healthcare personnel need better training for correct medical waste management since it has raised occupational exposure rates[12]. Universal precautions should be implemented correctly and repeatedly for healthcare waste management according to the recommendations of the Centre for Disease Prevention and Control[13]). Hospital waste disposal techniques will become safer for both community members and healthcare personnel when every staff member possesses basic competence about waste hazards and handling methods[14]. Multiple research projects exist which evaluate the knowledge levels and work activities of medical staff. The wide range of knowledge determinants would make studies difficult to compare for their completeness despite these limitations few original research publications meet the criteria. The study conducted in Jaipur India revealed healthcare personnel knowledge levels about healthcare waste management where 29% of subjects showed no concern about safety and 36% of nurses demonstrated poor understanding[15].

Worldwide awareness has grown regarding the need to impose stricter controls on the handling and disposal of wastes generated by healthcare facilities. However, the attention of Asian developing countries towards safe disposal of healthcare wastes is mostly diluted[16]. The exposure to infectious and hazardous waste can cause serious health problems to those who handle it, particularly to waste collectors or rag pickers. This can also become a source of many communicable diseases[17].

Importance of the Study: This study will assess nurses' knowledge and the current medical waste management system in Al-Imam Al-Hussein Medical City, identifying problems and potential solutions. This research will evaluate nurses' knowledge toward medical waste management at Al-Imam Al-Hussein Medical City to identify problems and assess the current system.

METHODOLOGY

A cross-sectional descriptive study was conducted to determine nurses' knowledge medical waste management at Al-Imam Al-Hussein Medical City in Karbala City during the period 30th September 2024 to 15th February 2025.

Study Sample: The researcher collected data by using non-probability "convenience" sample from (318) nurses employed in specific departments of the hospital who satisfied eligibility requirements. A different group of 30 nurses served as participants in the pilot study then were excluded from the main analysis.

Study Instrument: The researcher developed a special questionnaire through literature review which served as the basis for this study to accomplish its objectives. This questionnaire includes two parts**:**

Part I: Demographic Characteristics: This part consists of (6) items that include: (Age, sex, educational level, years of experience, participation in training course, department (units).

Part II: Nurses knowledge about medical waste management: Five parts make up the second section of the questionnaire and each part comprises forty-six items. Eleven professionals reviewed the questionnaire in order to evaluate its validity dimension. A vast majority of the experts declared the survey to be appropriate and easy to understand. The questionnaire underwent changes according to evaluations from expert sources. A Cronbach's alpha value of 0.910 indicates "knowledge scale" demonstrates outstanding evaluation which confirms the questionnaires possess proper internal consistency and equivalence measurability.

Statistical Analysis

Descriptive Data Analysis and Statistics

Frequency (f): In statistics the frequency of an event is the number of times the event occurred in an experiment or study

Percentage (%): A percentage is a number or a ratio stated as a fraction of 100 in mathematics.

Mean (M) and Standard Deviation:
The "mean" in biostatistics refers to the arithmetic average of a set of values. In statistics, the "standard deviation" is a measure of the amount of variation or dispersion of a random variable expected about its mean.

RESULTS

The analysis of finding in Table (1) shows that most of nurses are young fall within age group of 20 – 29 years with average age of 28±6 years. Only five of them are seen within age group of 50 – 59 year (1.6%).

The sex of nurses reveals that female nurses are more than male nurses as seen with 58.2% females and 41.8% males.

Regarding qualification in nursing, the highest percentage refers to bachelor degree in nursing among 49.7% out of 318 followed by diploma degree among 39.3%.

The years of experience for nurses is reported with average of 4.7± 5.6 year, 66.4% of nurses have 1 – 5 years of experience, expert nurses seen with minor percentages (11 – 20 years, 7.5% and 21+ year, 3.5%).

Regarding participation in training courses about medical waste management, 30.8% of nurses reported their participation distributed over various number of courses that is highly frequent with 1 – 3 training courses among 28.3%. The Unit department of nurses working in distributed over various units; 12.6% is seen from each unit of operation room, medical, emergency, intensive care, resuscitation, and hemodialysis. 12.2% is seen from general surgery unit and consultation unit.

This table 2 demonstrate that nearly half of the nurses (46.5%) demonstrated a "Fair" level of knowledge about medical waste management. While 30.8% exhibited "Good" knowledge, a concerning 22.6% displayed "Poor" knowledge.

The analysis of finding in Table (3) indicates that age shows no significant relationship with knowledge. Gender, however, shows a weak but significant inverse correlation ($r = -0.145$, $p = 0.010$), with males scoring slightly higher than females. Qualification in nursing demonstrates a highly significant relationship ($p = 0.002$), with knowledge increasing as qualifications advance, particularly among those with bachelor's degrees or higher. Similarly, years of experience show a weak inverse relationship ($r = -0.153$, $p = 0.006$), where nurses with less experience tend to have higher knowledge levels. Participation in training courses exhibits the strongest and most significant relationship ($r = 0.399$, $p = 0.001$), with nurses who participated in more training sessions showing markedly higher knowledge scores.

DISCUSSION

Study findings indicated that the greater percentage (76.4%) of nursing staff was within the age group of 20 – 29 years, (16.7%) was in the age group of 30 – 39 years, (5.3%) was in the age group of 40 – 49 years and (1.6%) in the age group of 50 – 59 years, this finding supports[18]

who conducted a research study to assess the knowledge of nurses staff which found that the most participants are less than 30 years. According to subjects' educational qualification, the majority (49.7%) of the respondents was holding bachelor in nursing. this agreement with[19] who found that most of nurses (78.2%) had nursing bachelor's degree.

The half of nurses (66.4%) had generally less than five years' experience as a nurse. In addition, years of experience show a weak inverse relationship, where nurses with less experience tend to have higher knowledge levels. This finding supports the study conducted by[20] which entitled "Assessment of knowledge, attitude, and practice in respect of medical waste management among healthcare workers in clinics" found that the majority of nurses with (52.0%) had less than 5 years in their occupation. Findings of our study demonstrated that the majority of the sample (69.2%) did not participate previously in participation in training courses similar to a study done by[21] which founded that (79.7%) of nurses had not participated in any training courses during their working periods and only (20.3%) nurses have participated in medical waste management training course.

The study results indicate that nearly half of the nurses showed an "acceptable" level of knowledge about medical waste management. While most of them showed "good" knowledge, a few showed "poor"

Table 1. Distribution of nurses according to their Socio-demographic Characteristics

List	Characteristics		f	%
1	**Age (year)M±SD= 28 ± 6**	20 – 29	243	76.4
		30 – 39	53	16.7
		40 – 49	17	5.3
		50 – 59	5	1.6
		Total	***318***	***100***
2	**Sex**	Male	133	41.8
		Female	185	58.2
		Total	***318***	***100***
3	**Level of Education of nurses' staff**	Preparatory school	30	9.4
		Diploma	125	39.3
		Bachelor	158	49.7
		Master	4	1.3
		Doctorate	1	0.3
		Total	***318***	***100***
4	**Years of experienceM±SD= 4.7 ± 5.6**	Less than 1	15	4.7
		1 – 5	211	66.4
		6 – 10	57	17.9
		11 – 20	24	7.5
		21 +	11	3.5
		Total	***318***	***100***
5	**Participation in training courses**	No	220	69.2
		1 – 3	90	28.3
		4 – 6	6	1.9
		7 +	2	0.6
		Total	***318***	***100***
6	**Department (unit)**	General Surgery	39	12.2
		Operation Room	40	12.6
		Medical	40	12.6
		Emergency	40	12.6
		Intensive Care	40	12.6
		Resuscitation	40	12.6
		Hemodialysis	40	12.6
		Consultation	39	12.2
		Total	***318***	***100***

f: Frequency, %: Percentage, M: Mean, SD: Standard deviation

Table 2. Overall Assessment of Nurses' Knowledge about Medical Waste Management

Overall Knowledge	f	%	M	SD	Ass.
Poor	72	22.6	**24.76**	**11.645**	**Fair**
Fair	148	46.5			
Good	98	30.8			
Total	**318**	**100**			

f: Frequency, %: Percentage. M: Mean for total score, SD: Standard Deviation for total score, Ass: Assessment Poor= 0 – 15.33, Fair= 15.34– 30.66, Good= 30.67 – 46

Table 3. Relationships among Level of Nurses' Knowledge about Medical Waste Management and their Sociodemographic Variables

Variables		Overall knowledge		
		Mean	**SD**	**Relationship**
Age (year)	20 – 29	25.43	11.517	**r^s = .247** **P-value= .400** **Sig= N.S**
	30 – 39	22.43	11.980	
	40 – 49	24.53	12.738	
	50 – 59	17.80	6.834	
	Total	24.76	11.645	
Sex	Male	26.79	11.286	**r^*= - .145** **P-value= ..10** **Sig= S**
	Female	23.31	11.711	
	Total	24.76	11.645	
Qualification in nursing	Preparatory school	19.20	10.575	**r^s = .174** **P-value= .002** **Sig= H.S**
	Diploma	23.82	11.300	
	Bachelor	26.74	11.747	
	Master	16.25	9.032	
	Doctorate	32.00	.	
	Total	24.76	11.645	
Years of experience	Less than 1	28.67	11.854	**r^s = -.153** **P-value= .006** **Sig= S**
	1 – 5	25.23	11.539	
	6 – 10	24.30	11.523	
	11 – 20	20.54	12.666	
	21 +	22.18	10.713	
	Total	24.76	11.645	
Participation in training courses	No	21.69	10.785	**r^s = .399** **P-value= .001** **Sig= H.S**
	1 – 3	31.48	10.625	
	4 – 6	34.33	11.483	
	7 +	32.50	.707	
	Total	24.76	11.645	

r^s: Spearman Correlation coefficient, r^*: Biserial correlation coefficient, P: Probability, Sig: Significance, N.S: Not Significant, S: Significant, H.S: High Significant

knowledge. These results are supported by[22] that conducted in four regions (Saurashtra, Central, South, and North Gujarat in India). which founded that half of nurses have moderate level of knowledge about medical waste management, and the study findings agreement with study result done by[23] which revealed that the majority of nurses had moderate knowledge regarding health care waste management and had adequate practices in most areas of waste management Sociodemographic variables play a significant role in understanding nurses' knowledge of medical waste management practices. Study found that younger workers (20–30 years) had higher knowledge of medical waste management. Similarly,[24] in Delhi reported that these conflicting findings may be attributed to the adequacy and frequency of training sessions conducted in the respective study settings.

CONCLUSION

The study found that most of nurses had a "Fair" level of knowledge about medical waste management. Younger nurses, were more likely to have better knowledge levels regarding medical waste management practices. A weak inverse relationship was noted between years of experience and knowledge, indicating that less experienced nurses tended to have higher knowledge. The overall findings suggest a moderate level of knowledge among nurses, which is consistent with other studies in the field. The research emphasizes the need for enhanced training and education on medical waste management to improve nurses' knowledge and improve the infection control strategies in hospital.

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Competing Interest: None

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