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Assessment of Knowledge, Attitudes, and Practices of Medical Waste Management for Healthcare Providers in Two of Government Hospitals in Karbala, Iraq

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Abstract. *Background: Medical waste is a significant health danger and environmental pollution problem due to its hazardous composition. The expertise and practice of healthcare staff in the proper removal of medical waste is essential for good medical waste management. The purpose of this study was to analyze the knowledge, attitudes, and practices related to medical waste management among healthcare workers in hospitals in Karbala/Iraq. Materials and Methods: descriptive cross-sectional study was conducted using a questionnaire distributed to health care providers in two selected hospitals in Karbala/ Iraq. Results: The results showed the good level of knowledge, attitudes and practices of healthcare providers towards medical waste. There is statistical significance between health care providers' knowledge, attitudes and practices towards medical waste, and their educational level and training courses. In addition to the recording of the statistical significance that were between knowledge with attitudes and practices. The levels can be categorized as positive but it is important to focus on increasing and improving the training of health care providers as it is the basis of the medical waste treatment process. Conclusion: increasing knowledge is one of the best tools to maintain proper workflow in isolating medical waste and maintaining the safety of employees, patients, and the environment.*

1. INTRODUCTION

Healthcare waste (HCW) provides a greater risk of infection and injury compared to normal waste. Improper waste treatment provides serious dangers of disease transmission to waste handlers, health workers, patients, the community as a whole, and the environment (A. K. Das et al., 2021).

Healthcare facilities generate dangerous waste, including pathological and infectious waste, sharp objects, and chemical materials, from various therapeutic procedures such as surgery, delivery, gangrenous organ resection, autopsy, biopsy, para-clinical tests, and injections. These wastes may contain disease-causing germs like hepatitis B and AIDS (Prüss-Üstün et al., 2005). Around 80% of routine waste has a harmful component (Uloma et al., 2022). It raises waste

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creation and raises risks to the safety of healthcare staff and patients (Ajbar El Gueriri et al., 2023).

Iraq has issued many laws to protect and preserve the environment from pollution and protect people, in addition to the legislation and instructions issued by the Ministry of Health and Environment (Khaled & Ali, 2022).

In addition to knowledge, suitable and safe attitudes and behaviors for dealing with medical waste during handling and disposal are essential. Inadequate training of healthcare personnel and neglect in applying legislation and norms may cause improper disposal of medical waste. It could lead to serious risks to the environment and community health (Mohammed et al., 2017).

HCFs require continuous health education for management and support staff members to implement secure medical waste handling and management processes (Mbarki et al., 2013). The purpose of this study was to evaluate the knowledge, attitude, and practices of HCPs in HCFs of two hospitals in the Karbala governorate.

2. MATERIALS AND METHODS

Description of the Study:

The study is descriptive cross-sectional. conducted to assessment of knowledge, attitudes, and practices of medical waste management for healthcare providers in some of holy Karbala governorate hospitals (Imam Hassan Al-Mujtaba Teaching Hospital, Imam Hussein Medical City), which is located about 105 kilometers southwest of Baghdad, the capital of Iraq., estimated the area of the governorate is about 52,856 km2. The Stephen Thomson equation was used to select 231 HCPs at two hospitals, with a margin of error of 5% and 95% confidence level.

Methods of measurement

The questionnaire followed prior research, the Iraqi National Infection Control Manual, and the Iraqi Ministry of Health's guidelines. The questionnaires' reliability was assessed using Cronbach's alpha scale, obtaining a satisfactory result of 78.9%.

The questionnaire was divided into four sections as follows:

1. The first part provides socio-demographic information.
2. The second part focuses on healthcare professionals' expertise and information on medical waste management. This part consists of 12 items with yes, no, or I don't know responses, with scores of 3, 2, and 1.

3. The third part assesses HCPs' views towards medical waste management through 10 items scored as agree, neutral, or disagree (3, 2, and 1).
4. The fourth part evaluates HCPs' medical waste management practices, with 12 items scored as always, sometimes, or never (3, 2, and 1).

Statistical data analysis

The data were analyzed with the Statistical Package for the Social Sciences (SPSS) version 23. The questionnaire responses were assessed using a three-point Likert scale. Chi-square analysis (X2) was used to compare questionnaire groups based on socio-demographic factors ($P < 0.05$). Spearman's test was used to correlate participants' knowledge and attitudes in the questionnaire ($P < 0.01$).

3. RESULTS

Socio demographic characteristic

Table 1 shows that (64.9%) of health worker were trained for waste segregation

Table 1. Socio demographic characteristic

variables		N	(%)
hospital	Imam Hassan Al-Mujtaba Teaching Hospital	113	(48.9)
	Imam Hussein Medical City	118	(51.1)
	Total	231	100
sex	Male	110	(47.6)
	Female	121	(52.4)
	Total	231	100
age	Less than 20 years	0	(.0)
	21-29 years	156	(67.5)
	30-39 years	66	(28.6)
	40-49 years	9	(3.9)
	50 and more	0	(.0)
	Total	231	100
education level	Diploma	85	(36.8)

	Bachelor's degree	129	(55.8)
	Other	17	(7.4)
	Total	231	100
job	Medical staff	48	(20.8)
	Para medical staff	107	(46.3)
	Nurses staff	76	(32.9)
	Total	231	100
Marital Status	Single	111	(48.1)
	Married	111	(48.1)
	Divorce	9	(3.9)
	Total	231	100
job years	Less than 5 years	154	(66.7)
	5-14 years	51	(22.1)
	15-24 years	21	(9.1)
	25 years and more	5	(2.2)
	Total	231	100
Waste segregation training	Yes	150	(64.9)
	No	81	(35.1)
	Total	231	100

Knowledge, Attitude and Practice about medical waste management

Table 2 shows that (83.1%) of health worker knew the color used in medical waste sorting bags for each type of waste and (84%) of them knew the dangers of medical waste.

Table 2. Knowledge about medical waste management

No	Questions	Yes	IDK	No	Total	Mean	SD
1	Do you know the color used in medical waste sorting bags for each type of waste?	192 (83.1)	19 (8.2)	20 (8.7)	231 (100.0)	2.7446	.60408
2	Did you know that general waste is placed in black bags?	27 (11.7)	5 (2.2)	199 (86.1)	231 (100.0)	2.7446	.65252
3	Is infectious waste mixed with general waste?	176 (76.2)	17 (7.4)	38 (16.5)	231 (100.0)	2.5974	.75630

4	Should a specific vaccine be given to medical waste workers?	174 (75.3)	38 (16.5)	19 (8.2)	231 (100.0)	2.6710	.62204
5	Is expired medicine considered medical waste?	177 (76.6)	25 (10.8)	29 (12.6)	231 (100.0)	2.6407	0.69526
6	Is pharmaceutical waste placed in brown bags?	68 (29.4)	101 (43.7)	62 (26.8)	231 (100.0)	2.026	0.75136
7	Do you know the dangers of medical waste?	194 (84.0)	20 (8.7)	17 (7.4)	231 (100.0)	2.7662	0.57247
8	Is infectious waste placed in yellow bags?	133 (57.6)	49 (21.2)	49 (21.2)	231 (100.0)	2.3636	0.81148
9	Is the maximum packing capacity of a container 3/4 of the container?	114 (49.4)	92 (39.8)	25 (10.8)	231 (100.0)	2.3853	0.67473
10	Is medical waste separated once it is produced?	115 (49.8)	74 (32.0)	42 (18.2)	231 (100.0)	2.316	0.76309
11	Is AIDS transmitted through medical waste?	160 (69.3)	36 (15.6)	35 (15.2)	231 (100.0)	2.5411	0.74413
12	Do you have information about acupuncture-related injury procedures?	170 (73.6)	33 (14.3)	28 (12.1)	231 (100.0)	2.6147	0.69379

Table 3 shows that (96.5%) thought medical waste management is important and (94.4%) thought important to use color coding in sorting medical waste

Table 3. Attitude about medical waste management

No	Questions	Agree	Neutral	Disagree	Total	Mean	SD
1	Do you think medical waste management is important?	223(96.5)	8(3.5)	0(.0)	231 (100.0)	2.9654	0.18324

2	It is important to use color coding in sorting medical waste	218(94.4)	13(5.6)	0(.0)	231(100.0)	2.9437	0.23096
3	Medical waste management has a serious impact on the public and the environment	192(83.1)	28(12.1)	11(4.8)	231(100.0)	2.7835	0.51574
4	It is your duty to separate medical waste	185(80.1)	28(12.1)	18(7.8)	231(100.0)	2.7229	0.59807
5	All health workers separate medical waste	142(61.5)	62(26.8)	27(11.7)	231(100.0)	2.4978	0.69704
6	Health care providers should receive special training in medical waste management	210(90.9)	19(8.2)	2(.9)	231(100.0)	2.9004	0.32777
7	A specialized and trained team must be formed to manage medical waste in hospitals	213(92.2)	18(7.8)	0(.0)	231(100.0)	2.9221	0.26863
8	Anyone who does not comply with administration instructions must be held accountable	207(89.6)	22(9.5)	2(.9)	231(100.0)	2.8874	0.34309
9	There are no injuries resulting from medical waste management in your hospital	39(16.9)	100(43.3)	92(39.8)	231(100.0)	2.2294	0.71881

10	There is no need to implement new policies for medical waste management in Iraqi hospitals	11(4.8)	64(27.7)	156(67.5)	231(100.0)	2.6277	0.57477

Table 4 shows that (90%) of health worker wash my hands after handling medical waste.

Table 4. Practice about medical waste management

No	Questions	Always	Sometime	Never	Total	Mean	SD
1	I separate medical waste	153(66.2)	74(32.0)	4(1.7)	231 (100.0)	2.6450	0.51454
2	Wear gloves when working with medical waste	186(80.5)	44(19.0)	1(.4)	231 (100.0)	2.8009	0.41094
3	Wash my hands after handling medical waste	208(90.0)	22(9.5)	1(.4)	231 (100.0)	2.8961	0.31969
4	I do not correct the error in separating medical waste if this occurs	44(19.0)	104(45.0)	83(35.9)	231 (100.0)	2.1688	0.72356
5	Place sharp medical waste in solid containers	176(76.2)	46(19.9)	9(3.9)	231 (100.0)	2.7229	0.52861
6	Sharp medical waste containers are not reused after being emptied	90(39.0)	86(37.2)	55(23.8)	231 (100.0)	2.1515	0.77934
7	I do not recap the needle after using it	51(22.1)	53(22.9)	127(55.0)	231 (100.0)	1.6710	0.81560
8	Have not experienced needlestick injuries while handling medical waste.	79(34.2)	85(36.8)	67(29.0)	231 (100.0)	2.0519	0.79503

9	I report injuries resulting from medical waste if they occur	141(61.0)	75(32.5)	15(6.5)	231 (100.0)	2.5455	0.61599
10	I do not fill bags or containers with more than their capacity with medical waste	122(53.0)	61 (26.5)	47(20.4)	231 (100.0)	2.33	0.794
11	Medical waste bags are closed well before transportation	147(63.6)	75(32.5)	9(3.9)	231 (100.0)	2.5974	0.56553
12	A vehicle is used to transport medical waste from the places where it is generated	142(61.5)	63(27.3)	26(11.3)	231 (100.0)	2.5022	0.69077

Table 5 shows a significant result in relationship between knowledge and job years

Table 5. Relationship between the level of the respondents' knowledge in medical waste management and their social-demographic

Variables		**Evaluation**				**P Value**
		Fair		**Good**		
		N	**(%)**	**N**	**(%)**	
Hospital	Imam Hassan Al-Mujtaba Teaching Hospital	28	(39.4)	85	(53.1)	.055
	Imam Hussein Medical City	43	(60.6)	75	(46.9)	
Sex	Male	31	(43.7)	79	(49.4)	.422
	Female	40	(56.3)	81	(50.6)	
Age	<30 years	47	(66.2)	109	(68.1)	.053
	30-39 years	18	(25.4)	48	(30.0)	
	≥40 years	6	(8.5)	3	(1.9)	

Education level	Diploma	20	(28.2)	65	(40.6)	.194
	Bachelor's degree	45	(63.4)	84	(52.5)	
	Other	6	(8.5)	11	(6.9)	
Job	Medical staff	20	(28.2)	28	(17.5)	.107
	Para medical staff	33	(46.5)	74	(46.3)	
	Nurses staff	18	(25.4)	58	(36.3)	
Marital status	Single	30	(42.3)	81	(50.6)	.501
	Married	38	(53.5)	73	(45.6)	
	Divorce	3	(4.2)	6	(3.8)	
Job years	Less than 5 years	49	(69.0)	105	(65.6)	.071
	5-14 years	10	(14.1)	41	(25.6)	
	15-24 years	9	(12.7)	12	(7.5)	
	25 years and more	3	(4.2)	2	(1.3)	
Waste segregation training	Yes	34	(47.9)	116	(72.5)	**.000***
	No	37	(52.1)	44	(27.5)	

*Significant difference between proportions using Pearson Chi-square test at 0.05 level.
For cell have expected count less than 5, we used Fisher's Exact test at 0.05 level

Table 6 shows a significant result in relationship between attitude and Waste segregation training

Table 6. Relationship between the level of the respondents' attitude in medical waste management and their social-demographic

Variables		**Evaluation**				**P Value**
		Fair		**Good**		
		N	**(%)**	**N**	**(%)**	
Hospital	Imam Hassan Al-Mujtaba Teaching Hospital	9	(52.9)	104	(48.6)	.730
	Imam Hussein Medical City	8	(47.1)	110	(51.4)	
Sex	Male	6	(35.3)	104	(48.6)	.290
	Female	11	(64.7)	110	(51.4)	

Age	<30 years	15	(88.2)	141	(65.9)	0.59
	30-39 years	1	(5.9)	65	(30.4)	
	≥40 years	1	(5.9)	8	(3.7)	
Education level	Diploma	6	(35.3)	79	(36.9)	.445
	Bachelor's degree	11	(64.7)	118	(55.1)	
	Other	0	(.0)	17	(7.9)	
Job	Medical staff	4	(23.5)	44	(20.6)	.371
	Para medical staff	10	(58.8)	97	(45.3)	
	Nurses staff	3	(17.6)	73	(34.1)	
Marital status	Single	9	(52.9)	102	(47.7)	.667
	Married	8	(47.1)	103	(48.1)	
	Divorce	0	(.0)	9	(4.2)	
Job years	Less than 5 years	13	(76.5)	141	(65.9)	0.379
	5-14 years	2	(11.8)	49	(22.9)	
	15-24 years	1	(5.9)	20	(9.3)	
	25 years and more	1	(5.9)	4	(1.9)	
Waste segregation training	Yes	5	(29.4)	145	(67.8)	**.001***
	No	12	(70.6)	69	(32.2)	

*Significant difference between proportions using Pearson Chi-square test at 0.05 level.

For cell have expected count less than 5, we used Fisher's Exact test at 0.05 level

Table 7 shows a significant result in relationship between attitude and Education level and waste segregation training.

Table 7. Relationship between the level of the respondents' practice in medical waste management and their social-demographic

Variables		**Evaluation**						**P Value**
		Fair		**Good**		**Poor**		
		N	**(%)**	**N**	**(%)**	**N**	**(%)**	
Hospital	Imam Hassan Al-Mujtaba Teaching Hospital	59	(49.6)	49	(47.6)	5	(55.6)	.869
	Imam Hussein Medical City	60	(50.4)	54	(52.4)	4	(44.4)	

Sex	Male	58	(48.7)	49	(47.6)	3	(33.3)	.712
	Female	61	(51.3)	54	(52.4)	6	(66.7)	
Age	<30 years	87	(73.1)	64	(62.1)	5	(55.6)	.334
	30-39 years	28	(23.5)	34	(33.0)	4	(44.4)	
	≥40 years	4	(3.4)	5	(4.9)	0	(.0)	
Education level	Diploma	38	(31.9)	47	(45.6)	0	(.0)	**.010**
	Bachelor's degree	73	(61.3)	47	(45.6)	9	(100.0)	
	Other	8	(6.7)	9	(8.7)	0	(.0)	
Job	Medical staff	28	(23.5)	18	(17.5)	2	(22.2)	.228
	Para medical staff	57	(47.9)	44	(42.7)	6	(66.7)	
	Nurses staff	34	(28.6)	41	(39.8)	1	(11.1)	
Marital status	Single	60	(50.4)	50	(48.5)	1	(11.1)	.**010**
	Married	58	(48.7)	45	(43.7)	8	(88.9)	
	Divorce	1	(.8)	8	(7.8)	0	(.0)	
Job years	Less than 5 years	82	(68.9)	66	(64.1)	6	(66.7)	.507
	5-14 years	27	(22.7)	23	(22.3)	1	(11.1)	
	15-24 years	7	(5.9)	12	(11.7)	2	(22.2)	
	25 years and more	3	(2.5)	2	(1.9)	0	(.0)	
Waste segregation training	Yes	69	(58.0)	76	(73.8)	5	(55.6)	**.040***
	No	50	(42.0)	27	(26.2)	4	(44.4)	

*Significant difference between proportions using Pearson Chi-square test at 0.05 level.

For cell have expected count less than 5, we used Fisher's Exact test at 0.05 level

Table 8 shows that knowledge has a positive correlation with attitude and practices.

Table 8. The correlation between knowledge, attitude and practices

Correlations				
		Knowledge level	**Attitude level**	**Practice level**
Knowledge level	**Pearson Correlation**	1	**.234****	**.167***

	Sig. (2-tailed)		.000	.011
	N	231	231	230
Attitude level	**Pearson Correlation**	**.234****	1	.088
	Sig. (2-tailed)	.000		.184
	N	231	231	230
Practice level	**Pearson Correlation**	**.167***	.088	1
	Sig. (2-tailed)	.011	.184	
	N	230	230	230

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

4. DISCUSSION

The questionnaire was distributed equally to all classifications, with the highest response group (67.5%) occurring between the ages of 21 and 29. These findings agree with previous research indicating that most healthcare professionals are between the ages of 21 and 30 (S. K. Das & Romy Biswas, 2016).

Respondents' knowledge towards medical waste management

Health workers' knowledge is crucial for dealing with medical waste effectively.

The results of the study showed, by evaluating the knowledge related to the segregation of medical waste by HCPs, that a large percentage of the participants have a high understanding of dealing with medical waste in terms of using color code (83.1 %) segregating infectious waste (76.2%), but about (86.1%) were had poor knowledge for segregating general wastes. and this is agree with (Khaled & Ali, 2022) where they found In a study conducted at Al Basrh governorate/ Iraq , that a large percentage of the participants have a high understanding of dealing with medical waste in terms of using color code (80%) and infectious waste (83.6%) but disagree with segregating general wastes (96.4%).

Respondents' attitudes towards medical waste management

Self-awareness among healthcare practitioners is crucial to handling medical waste and improving process quality (Akkajit et al., 2020)

With the respondents' generally positive views, 96.5 percent said it was important to deal with medical waste, and 94.4 percent used the color code. This finding is consistent with a study conducted in India (Rudraswamy et al., 2012), where (95.5%) of respondents noted the necessity of dealing with medical waste, and (87.2%) used the color code.

Respondents' Practice towards medical waste management

Although 96.5% of employees recognize the need for safe medical waste disposal, only 66.2% separate medical waste, this result agree with a research (Woromogo et al., 2020), the level of practice was poor at 83.0%.

They were following standard procedures, whether due to a sense of responsibility or supervision by infection control or public health teams, which is beneficial to a safe working environment. As is well known, healthcare providers are at a high risk of infection from medical waste because of the nature of their work, so the answer is (80.5%) that wear gloves when handling medical waste and (90%) wash their hands, these practices, despite their simplicity, are an important factor in preventing infection in hospitals and protecting health workers and patients.

Influence of socioeconomic and occupational characteristics on the level of knowledge, attitude and practice (KAP) of the HCP

In this section, the significance of training is demonstrated statistically in order to build information about separating medical waste (knowledge, attitude and practice), as well as developing views and validating the correct ones by presenting challenges and solutions.

Correlations among KAP and medical waste management

This study highlighted the necessity of distributing knowledge and providing training on medical waste management, which leads to increased medical awareness and also to the proper and effective operation of medical waste management.

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