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Evaluation of Medical Waste Management in Three Hospitals in Basrah Governorate,Iraq

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***Abstract*—Health institutions create between 10 and 15 percent of their total waste as hazardous waste, consisting of substances contaminated with patient blood or bodily secretions, and need special handling to make it safe for disposal due to its environmental and public health risks. The data was collected by designing a self-assessment questionnaire. Three government hospitals in Basrah were randomly selected.**

The results showed that only one hospital got a high level, while the remaining two hospitals received a medium level because of transportation issues and inadequate medical waste storage. As it related to assessing healthcare providers' knowledge, attitudes, and practices toward medical waste, the results were positive at 91.6 % knowledge level, 85.4 % attitude level, and 87.8 % practice level. The situation of medical waste in the governorate requires additional effort on the part of the responsible authorities in terms of adopting new technologies in hospital waste management and promoting more education and training for staff.

***Keywords*—Barsah; Evaluation; Iraq; Management; Medical waste**

I INTRODUCTION

Medicalwasteincludeswastefromhospitals,researchfacilities,andlaboratories, in addition to waste generated from "secondary" or "scattered" sources such asthose that arise in the context of home health care (dialysis, insulin injections, etc.) (YvesChartieretal.,2014).Themedicalsectorhasseensignificantdevelopmentsallovertheworld. The interest in medical waste began in 1980 when it gained worldwide attention due toits infectious nature (Harhay et al., 2009). According to estimations by (WHO Healthcarewaste, 2018), the quantity of waste produced by healthcare operations is estimated to be 15% of infectious waste and 85% of general non-hazardous waste. The environment and publichealtharenegativelyimpactedbyimproperhealthcarewastemanagement,whichfrequentlyhas problems properly disposing of sharp and infectious waste and the occupationalsafety of those who handle the waste (Abd El-Salam, 2010). The hospital's medical and non-medical workers, waste handlers, patients, and visitors are those most at risk from the dangers ofinappropriate clinical waste management (Akter and Tränkle., 2003).

Furthermore, healthcareprofessionals are not well-informed about the dangers posed by medical waste (Katoch., 2007). Studies show several biological, physical, and chemical dangers in workers handling medical waste, including needle sticks, wounds, falls, strains, sprains, burns, and eye and back injuries.Duetoexposuretomedicalwastesbothwithinandoutsidehospitalgrounds, many injuries, including hand cuts from handling shattered glass, occurred (Akter.,2000).

Establishing a health care system is an essential requirement of every society. Therefore,the problems arising from medical waste management have received great global attention, and many studies and research have been conducted on these issues (Babanyara,2013).Iraq has issued many laws to protect and preserve the environment from pollution and protect people (Iraqi Ministry of Justice, 2005), In addition to the legislation and instructions issued by the Ministry of Health and Environment (Ministry of Health and Environment, 2015) regarding the management of hazardous waste, And the National Infection Control Manual, which contained instructions for Iraqi health institutions on how to handle and manage medical waste from the moment it was produced until its disposal (Iraqi Ministry of Health, 2009). However, as in many other developing countries, healthcare waste management in Iraq and Basrah still needs significant improvements (Mohammed, 2011). The study was conducted to collect information about segregation, collection, transportation, storage, and final disposal, evaluate the actual situation of the medical waste management system in Basrah Governorate, southern Iraq,

and evaluate healthcare workers regarding knowledge, attitude, and practices.

II METHODOLOGY

A. Description of the Study Area

BasrahisanIraqigovernatelocatedinthefarsouthofIraq .Itisthethird- largestgovernorate in Iraq regarding population (2.9 million people according to the 2018 census) and thesixth-largest governorate in the area (19070 km2). The governorate center is the city of Basrah,which includes 7 districts. Itincludes 19 hospitals, 139 health centers, and 246 health facilities.

B. Typeof Study

The type of current study is a descriptive cross-sectional study conducted to assess medical waste management in some Basrah governorate hospitals (Alhadlaq, 2014).

C. Sampling and Data Collection

The present study was conducted from January to April 2022. Data were collected using a purpose-built questionnaire. Five hundred questionnaires were distributed to three government hospitals in Basrah, two of them in the center of Basrah (general (I) and specialized (II) hospitals) and one in the districts (III). The names of hospitals were not mentioned in this study to obtain reliable and accurate information from those responsible for managing medical waste and health workers in the hospitals. The sample was obtained using the Stephen Thomson equation (margin of error 5%, confidence level 95%, effect size 50%, and additive non-response 50%). The study population consists of medical waste management officials and health providers in hospitals (doctors, pharmacists, nurses, and health technicians), whose number is about 2553 health workers.

D. Questionnaire Preparation and Topics

Two initial questionnaires were prepared by the researcher to be used in collecting data and information based on previous studies, the Iraqi National Infection Control Manual, and the instructions of the Iraqi Ministry of Health (Iraqi Ministry of Health, 2009; Khalaf and Abdul- Salam, 2009; Akkajit et al., 2020). Cronbach's alpha scale was used to assess the reliability of the questionnaires, and a score of 78.9 was achieved, which is considered good. The questionnaires were presented to a group of 9 arbitrators who played an advisory and guiding role and modified the topics of the questionnaires. Data were collected through hospital field visits and interviews with medical waste management officials, workers, and health care providers.

The first questionnaire (for officials of medical waste management) was divided into eight parts. The first part includes general information, which is the name of the hospital, the number of departments in the hospital, the number of beds in the hospital, the monthly occupancy rate in the hospital, the number of employees in the hospital, and the monthly rate of medical waste in thehospital. The second part of this questionnaire is related to hospital policy and consists of 7 items answered with yes or no. The third part is related to containers and segregating medical waste, and it consists of 10 items, in which the answer is yes or no. The fourth part of the questionnaire is related to the collection and transportation of medical waste, and it consists of 14 items that are answered with yes or no. The fifth part is about storing medical waste and consists of 17 items answered with yes or no. The sixth part of the questionnaire is about training workers in the management and safety of medical waste. This section consists of 9 items that are answered with yes or no. The seventh part of the questionnaire includes the procedures taken by the hospital to treat medical waste and consists of 8 items. The eighth part of this questionnaire includes four different questions. Parts seventh and eighth of the questionnaire are answered in short sentences by officials of medical waste management and medical waste management workers.

The second questionnaire (for health care providers) was divided into fifth parts. The first part includes sociodemographic characteristics and consists of seven items: gender, age, educational level, occupation, marital status, number of years of service on the job, and training in medical waste management. The second part relates to the knowledge and information of health care providers. This part includes 12 items answered with yes, no, or I do not know. The third part adopts the attitude and opinions of health care providers and consists of 12 items that have been answered with agree, neutral, or disagree. The fourth part includes the practice of health care providers, and consists of 12 items answered often, sometimes, or never. The fifth part of the questionnaire was about some of the opinions, suggestions, and recommendations of healthcare providers, and it consisted of two paragraphs.

E. Statistical Analysis

Data for the current study were analyzed using the Statistical Package for the Social Sciences (SPSS) version 23. Stephen Thomson's equation was used to obtain the samples of the study. Cronbach's alpha scale was used to assess the questionnaires' reliability. A three-point Likert scale (Table 1) was used to assess the response of the questionnaire samples.

TABLE1. Three-point Likert scale was used to assess sample response and level adjustment.

Likert scale	Scoreinterval (mean)	Evaluation criteria
1	1-1.66	Low
2	1.67-2.33	Medium
3	2.34-3	High

III RESULTS

A. *Medical Waste Generation*

Table 2.shows the amount of medical waste generated in hospitals I, II, and III. The largest amount of medical waste was in hospital II (0.246 kg/day/ bed), followed by the hospital I (0.215 kg/day/bed). The lowest amount of medical waste was in hospital III (0.109 kg/day/bed). Hospital I, II, and III beds were 591, 125, and 207, respectively. The statistical analysis indicated that there were no statistically significant differences ($p > 0.05$) ($p=0.044$) in the amount of medical waste generated among the studied hospitals.

TABLE2. Amount of medical waste generated by hospitals I, II, and III

Hospital	Medical waste (kg/day)	No. of bed	Occupancy rate	Medical waste kg/day/bed
I	85.430	591	67%	0.215
II	19.440	125	63%	0.246
III	17.630	207	78%	0.109
Total	122.50	923	100%	0.384

B. *Medical Waste Management*

Table 3 summarizes the medical waste management policy in hospitals I, II, and III. It shows the authorities supervising medical waste management in the three studied hospitals, the source of instructions and laws that hospitals follow in managing medical waste, and the team responsible for managing medical waste in the hospitals under study.

Table 4 displays the training, personal safety equipment, vaccination, and routine examination of health workers in medical waste management in hospitals I, II, and III.

Table 5 demonstrates the segregation, collection, transportation, and storage of medical waste in hospital I, II, and III.

TABLE3. Medical waste management policy in hospitals I, II, and III

Hospital	**Supervising authority**	**Instructions and laws source**	**Responsible team**	**No. of responsible team visits**
I	1- Public Health Department 2-Infection control teams	1- The infection control guideline of the Iraqi Ministry of Health 2-The official documents of the Iraqi Ministry of Health	1-Community health doctors 2-Community health technicians 3-Physician's assistant 4-Environmental sciences	daily
II	1-Public Health department 2-Infection control teams	1- The infection control guideline of the Iraqi Ministry of Health 2- The official documents of the Iraqi Ministry of Health	1-Community health doctors 2-Community health technicians 3-Physician's assistant 4-Environmental sciences	daily
III	1- Public Health Department 2- Infection control teams	1- The infection control guideline of the Iraqi Ministry of Health 2-The official documents of the Iraqi Ministry of Health	1-Community health doctors 2-Community health technicians 3-Physician's assistant 4-Environmental sciences	daily

TABLE4. Training, personal safety equipment, vaccination, and routine examination of health workers in the management of medical waste in hospitals I, II, and III

Hospital	Training	Personal protective equipment	Vaccination	Routine examination
I	Infrequently and asneeded	Insufficient and sometimes notappropriate	Hepatitis B virus(HBV)	None
II	Infrequently and asneeded	Insufficient andsometimes notappropriate	Hepatitis B virus(HBV)	None
III	Infrequently and asneeded	Insufficient and sometimes notappropriate	Hepatitis B virus(HBV)	None

TABLE5. Segregation, collection, transportation, and storage of medical waste in hospitals I, II, and III

Hospital	Segregation	Collection	Transportation	Storage
I	1- Black bags for general medical waste. 2- Yellow bags for infectious, pharmaceutical, and pathological medical waste. 2-Red bags for highly infectious medical waste. 3-Solid containers for sharp medical waste.	Four times a day or more if necessary	Manually	1-In a room separate from the hospital, not hermetically enclosed, with good walls, Floor and lighting, water supply, and poorly ventilated. 2-Storage period, more than 24 hours.
II	1- Black bags for general medical waste. 2- Yellow bags for infectious, pharmaceutical, and pathological medical waste. 2-Red bags for highly infectious medical waste. 3-Solid containers for sharp medical waste.	Four times a day or more if necessary	By trolleys	1-In a room separate from the hospital, not hermetically enclosed, with good walls, Floor and lighting, water supply, and poorly ventilated. 2-Storage period, more than 24 hours.
III	1- Black bags for general medical waste. 2- Yellow bags for infectious, pharmaceutical, and pathological medical waste. 2-Red bags of highly infectious medical waste. 3-Solid containers for sharp medical waste.	Four times a day or more if necessary	Manually	1-In a room separate from the hospital, not hermetically enclosed, with bad walls, Floor, and lighting, not equipped with water, and poorly ventilated. 2-Storage period, more than 24 hours.

Table 6 provides scores of the responses of medical waste management officials to the five items of medical waste management (policy, segregation, collection and transportation, storage, and training).

TABLE6. Scores of the responses of medical waste management of officials to the five items of medical waste management in hospitals I, II, and III

Hospital	Policy	Segregation	Collection and Transportation	Storage	Training	Total	%
I	5	8	5	8	3	29	50.87
II	6	8	11	14	5	44	77.19
III	5	7	4	9	6	31	54.38
Maximumscore	7	10	14	17	9	46	100

Hospital II scored the highest score (44) (77.19%)in response to medical waste management, followed by hospital III (31) (54.38%) and I (29)(50.87%), respectively. Statistical analysis indicated that there were significant differencesbetween the responses of medical waste management officials to the above five items ofmedical waste management in the three hospitals under study ($p > 0.05$)($p= 0.018$).

C. Medical Waste Treatment and Disposal

Table7 lists the methods of treatment and disposal of general, Infectious, pathological, pharmaceutical, chemical, radiological, and liquid waste used in hospitals I, II, andIII.

Table7: Treatment and disposal ofmedicalwaste in hospitals I,II,and III

Hospital	General waste	Infectious waste	Pathological waste	Pharmaceutical , Chemical and Radiological waste	Liquid waste
I	Tolandfill	1-To Incinerators 2-By autoclaved	Byburial	Toincinerators	To the effluenttreatment system and then to the sewage
II	Tolandfill	1- By autoclaved 2- To another hospital for treatment	Byburial	Toincinerators	To the effluent treatment system and then to the sewage
III	Tolandfill	To another hospital for treatment	Byburial	Toincinerators	To the special ground tank and then to the sewage

D. Responding to the Questionnaire

Figure 1 shows the percentage of healthcare providers responding and non-responding to the questionnaire. The number of healthcare providers responding to the questionnaire was 335 respondents (67%) in all studied hospitals, while the number of healthcare providers non-responding to the questionnaire was 165 (33%). Figure 2 shows the percentage of healthcare providers responding to the questionnaire in Hospitals I, II, and III were 147 (43.9%), 98 (29.3%), and 90 (26.9%), respectively.

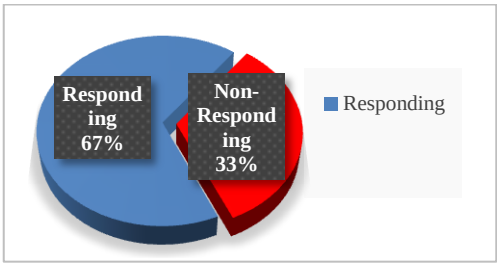

Figure 1: Percentage Of Healthcare Providers Responding And Non-Responding To The Questionnaire.

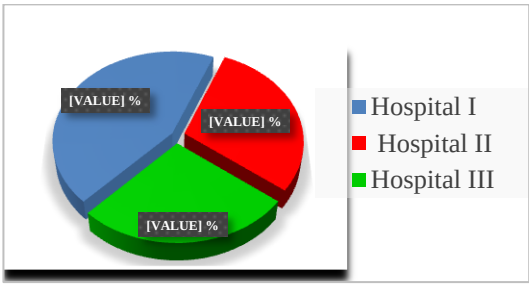

Figure 2: Percentage of healthcare providers responding in hospitals

E. Sociodemographic Characteristics

Table 8 represents the social and demographic characteristics of the healthcare provider's respondents in studying hospitals.

TABLE8. Sociodemographic characteristics of the respondents

Characters		Frequency (n= 335)	%
Gender	Male	88	26.3
	Female	247	73.7
Age	< 20 year old	9	2.7
	21-29 year old	165	49.3
	30-39 year old	92	27.5
	40-49 year old	59	17.6
	> 49 year old	10	3.0
Educational level	Preparatory school	69	20.6
	Diploma	137	40.9
	Bachelor's	125	37.3
	Postgraduate students	4	1.2
Occupation	Doctors	36	10.7
	Health staff	143	42.7
	Nursing	156	46.6
Marital status	Married	222	66.3
	Single	109	32.5
	Divorce	3	0.9
	Widower	1	0.3
Years of experience	< 5	182	54.3
	5-14	83	24.8
	15-24	55	16.4
	> 25	15	4.5
Training courses	Yes	176	52.5
	No	159	47.5

F. Respondents' Knowledge of Medical Waste Management

Table 9 shows the scores of responses of healthcare providers on 12 items of knowledge of medical waste management in the studied hospitals. Three hundred seventy (91.6%) of the respondents scored a high knowledge of medical waste management, and 28 (8.4%) had a medium knowledge of medical waste management. No common knowledge of medical waste management was recorded for the respondents.

TABLE9. Scores Of The Responses Of Healthcare Providers On 12 Items Of Knowledge Of Medical Waste Management In The Studied Hospitals

Level	Frequency	%
High knowledge	307	91.6
Medium knowledge	28	8.4
Low knowledge	---	---

G. Respondents' Attitude of Medical Waste Management

Table 10 shows the scores of responses of healthcare providers on 12 items of attitudes to medical waste management in the studied hospitals. Two hundred and eighty-six (85.4%) respondents scored a high level of attitude to medical waste management. Forty-six (13.7%) respondents recorded a medium attitude to medical waste management, and three (0.9%) had a low level of attitude to medical waste management.

TABLE10.Scores of the responses from healthcare providers on 12 items of attitudes to medical waste management in the studied hospitals

Level	Frequency	%
High attitudes	286	85.4
Medium attitudes	46	13.7
Low attitudes	3	0.9

H. Respondents' Practice of Medical Waste Management

Table 11 shows the scores of responses of healthcare providers on 12 items of practices in medical waste management in the studied hospitals. Two hundred and ninety (87.8%) respondents recorded a high level of practice in medical waste management, and 41 (12.2%) respondents scored a medium level of practice in medical waste management. No low level of practice in medical waste management was recorded for the respondents.

TABLE11.Scores of the responses of healthcare providers on 12 items of practices in medical waste management in the studied hospitals

level	Frequency	%
High practices	294	87.8
Medium practices	41	12.2
Low practices	---	---

IV DISCUSSION

A. WASTE GENERATION

The study results showed that the production of medical waste in the studied hospitals is directly related to the number of beds in the hospital. The production of medical waste in the three hospitals was within the normal range of WHO standards (WHO, 2018),and it was reported that the amount of medical waste generated in hospitals in developing and developed countries ranges from 0.50 to 3.00 kg/day/bed. Good medical waste management, such as proper segregation of medical waste, will significantly reduce the amount of hospital medical waste Kaplanet al. (2012). In the current study, Hospital II had the highest waste generation rate, while Hospital III had the lowest medical waste generation rate. The amount of medical waste generated in hospitals can vary in different countries and cities of the same country (Kerdsuwan and Laohalidanond, 2015).

B. MEDICAL WASTE MANAGEMENT

Although the Infection Control Department in the Basrah Governorate Health Department has established standardized procedures and instructions in the management of medical waste in all the governorate's hospitals, the authority responsible for managing medical waste in Basrah Governorate hospitals is not entirely clear whether the Public Health Department or the Infection Control Department. Two separate departments (i.e., Public Health Department and the Infection Control Department) perform the same tasks in the health institution in Basrah governorate (there is no clear separation between the work of the two departments), which may confuse the implementation of medical waste management procedures and instructions and the lack of proper use of human and material resources for the health institution in the governorate. Wangmo (2013) reported that in order to hold the departments, institutions, programs, and individuals involved in medical waste management accountable and prevent duplication and confusion in work, a clear policy

document for medical waste management should be developed with a distinction between roles and responsibilities. The Ministry of Health and the Basrah Health Department should set clear regulations and instructions formanaging medical waste and distinguish between the tasks of the concerned departments to prevent any conflict in work. Hagstrom (2006) documented that one of the obstacles to the proper management of medical waste in health institutions is resistance to change and the loss of horizontal and vertical contact between health staff in hospitals.

The color code of medical waste segregation bags is used in the studied hospitals to segregate medical waste. However, these bags were of poor quality and easy to rip due to the limited budget allocated to medical waste management in hospitals. The number of medical waste containers was insufficient at waste generation sites, which are regular containers without symbols indicating their medical waste content.Some guidelines have explained the correct segregation of medical waste near medical waste production areas. It has also been noted that some cases of improper medical waste segregation occur in hospitals.

Service workers in the three hospitals under study collect medical waste daily at the beginning of each shift (four shifts) and as often as needed. Medical waste collection bags are not classified according to the nature of the medical waste they contain. No tape is used to tie the medical waste collection bags, but they are folded manually. Regular monitoring and close supervision of medical waste management by the health institution through frequent and continuous visits to these facilities contributed to compliance. The problem arises in hospitals when medical waste is transferred from the generation areas to their storage places to be dealt with where the safety measures are insufficient. There are no carts to transport medical waste bags, but they are moved manually, exposing service workers and patients in the hospital to too many risks and diseases, such as hepatitis B infection. Al-Azzawi (2012) reported that a lack of coordination between related agencies and awareness among health workers hampers the proper handling of medical waste in hospitals. In the three hospitals, the central room for storing medical waste is located separately from the rest of the other parts of the hospital. Service workers and vehicles designated for transporting medical waste can easily access this room. No signs indicate the location of the central room for medical waste in the studied hospitals. The room is not well sealed, and insects and other animals can enter it easily. The storage period of medical waste in the central room lasts for more than 24 hours in the summer and winter, so this room is likely to be a source of transmission of infectious diseases and environmental pollution. Mathur et al. (2012) explained that improper handling of medical waste might cause environmental problems such as bad odors and the spread of many disease vectors, such as insects, rodents, and worms, which can transmit diseases such as typhoid, cholera, and viral hepatitis.

The specifications of the central medical waste storage room in the studied hospitals differ from one hospital to another. In Hospitals I and II, the central medical waste storage room was well-walled and lighted and had a water supply, but it was poorly ventilated. Hospital III's central medical waste storage room was below the required specifications. It was observed that medical waste was dumped in places not designated for waste disposal in the studied hospitals. It has been proven through the answers of healthcare providers in the three hospitals to some questions related to the management of medical waste that the hospital administration does not take the management of medical waste seriously. This reflects a lack of awareness of hospital management and poor training of healthcare providers about the dangers of medical waste. The current results showed that new service employees receive no training in medical waste management while old employees receive infrequently limited training. This may lead to a lack of knowledge about the dangers of medical waste and less interest in health workers in the management of medical waste. (Thamer and Al-Ramdan, 2021) A study they conducted in Al-Muthanna Governorate to evaluate infection control procedures recommended that employees be trained on proper procedures, particularly regarding segregating medical waste, to enhance and activate the work of infection control units. There is sufficient personal protective equipment in the three hospitals, but it is sometimes not commensurate with the nature of the work of the medical waste management staff. For example, it was observed that service workers specializing in managing medical waste in the studied hospitals wear medical gloves and ordinary shoes that do not fit the nature of work.

The evaluations of the three hospitals show that Hospital I and III were equivalent in terms of medical waste management, while Hospital II scored higher compared to Hospital I and III. The three hospitals achieved similar results regarding policy, training, safety, and waste segregation, which may be attributable to instructions for the unified or central medical waste management in the Basrah governorate. Hospital II has outperformed Hospitals I and III in transporting and storing medical waste because Hospital II was newly established a few years ago with good specifications and modern equipment for medical waste management compared to the other two hospitals that were established at the beginning and middle of the twentieth century and which are witnessing a slow development in the field of medical waste management and the provision of appropriate equipment and supplies. Harhay et al. (2009) showed the need for a combination of training programs and administrative and government solutions for medical waste management in health institutions because the training of medical personnel in developing countries improved some aspects of medical waste management but did not shed light on the cost of medical waste management materials (containers and incinerators) and

infrastructure solutions Infrastructure (administrative structure and regulations).

C. *TREATMENT AND DISPOSAL OF MEDICAL WASTE SOLID WASTE*

Incinerators are the most common method hospitals use in the Basrah governorate to treat and dispose of medical waste. Most incinerators are old and operate at temperatures as low as 400°C. According to a study (Mohammed, 2011) conducted to assess hospitals in the Basrah Governorate, most hospitals use old incinerators that burn waste at low temperatures, which releases toxic gases such as dioxin. The main disadvantage of incinerators operating at low temperatures is the release of toxic gases such as harmful dioxin gas, which is formed from burning medical waste containing chlorine compounds (Kizar, 2016). The presence of hospitals within residential areas in Basrah governorate may expose residents to the risk of toxic gas emissions from burning medical waste and other effects that these gases may cause on the environment. Some studied hospitals use autoclaves instead of incinerators to treat medical waste. This method is expensive and not available in most hospitals. It was also noted that the medical waste recycling method was not used in the hospitals under study. Since the devices and equipment used to treat medical waste are old and subject to continuous failure, and the difficulty of repairing and purchasing new devices and equipment due to the high cost, Basrah governorate hospitals face difficulty and problems in treating medical waste. This is demonstrated by the current study, as only one of the three hospitals studied treats medical waste, while the other two hospitals send medical waste to other hospitals for treatment.

Alhadlaq (2014) showed that medical waste treatment in the Kingdom of Saudi Arabia is carried out outside hospitals and health institutions by sending medical waste to specialized companies. This method of treating medical waste is rather interesting. Providing a place far from residential areas and equipping it with the devices and equipment necessary to treat medical waste for hospitals and health institutions in Basrah governorate is the appropriate solution to all the problems facing medical waste treatment in health institutions in the governorate, such as the high prices of medical waste treatment devices and equipment and the difficulty of providing them. This method will also reduce the risk of environmental and population exposure to air pollution resulting from medical waste treatment in health institutions.

D. *WASTE WATER*

In the three hospitals studied, the patient's blood and urine are poured into hospital sewers, and the sewers are then disinfected by pouring out quantities of liquid chlorine. Liquid medicines, cleaning supplies, and disinfectants are also drained into hospital sewers. Hospitals I and II have systems for treating wastewater before it is discharged outside the hospital. In Hospital III, there is no sewage treatment system inside the hospital, but effluents are disposed of in hospital ground tanks that are emptied when full outside the hospital, which may lead to the spread of infectious organisms outside the hospital, endanger the environment, and public health.

Although hospitals have unique systems to treat wastewater before it is discharged outside the hospital, there are still concerns about the effectiveness of these treatment systems. Al-Enezi (2016) studied the effect of wastewater in Al-Sadr Hospital in Basra Governorate on the water quality of the Shatt Al-Arab River. The author found that the pH value in all the studied treatment units sites in the hospital was greater than seven and that the concentrations of biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), total dissolved solids (TDS), PO4, NO3, and Cl were greater than the permissible limit according to the Iraqi specifications for water. The researcher also found the presence of large quantities of microorganisms in the water generated from the treatment unit in the hospital. Khan et al. (2019) explained that hospital wastewater poses a serious risk to human health and the environment and that many countries lack adequately treated wastewater in hospitals. Khan et al. (2020) highlighted the importance of implementing strict regulations for wastewater management in hospitals.

E. ASSESSMENT OF KNOWLEDGE, ATTITUDES, AND PRACTICES OF HEALTH CARE PROVIDER'S SOCIODEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Most healthcare workers participating in the study were female (73.7%). The number of female healthcare workers exceeded the number of healthcare workers in the studied hospitals. This may be due to the higher proportion of female employees than males. This appointment trend may put health institutions in general in front of major problems in the future because both sexes (males and females) have important and distinct role that differs from the other in health institutions. The results of the current study agree with the study of

(Mohammed et al., 2017), which was conducted in hospitals inthe Sulaymaniyah governorate. The author found that the ratio of female healthcare workers to male healthcare workers is 1:1.8. Therefore, the Ministries of Health and Higher Education and Scientific Research must take this issue seriously and consider it in the future. 47.5% of the healthcare workers in this study did not receive training courses on medical waste management in the studied hospitals. (Mohammed et al., 2017) Also, healthcare workers did not receive adequate training on medical waste management in hospitals of Sulaymaniyah governorate, but at a high percentage (79.7%). So in this regard, health institutions should implement continuous and regular training courses on medical waste management for healthcare workers in general and not only as needed to raise health knowledge and awareness on this subject. The age group of healthcare workers most involved in the current study ranged from 21-29 years. The result of the current study concerning the age group agrees with the study of (Das and Biswas,2016), who found that most health workers participating in their study on the subject of medical waste are between the ages of 21-30 years. These ages make up the majority of healthcare providers, with an average age of 31.80 years. The minor participants in the current study are the medical staff, and this may be because their numbers are lower in health institutions compared to other healthcare providers, so we had difficulty accessing large numbers of them.

F. RESPONDENT'S KNOWLEDGE OF MEDICAL WASTE MANAGEMENT

According to (Vaught,2018), health workers' knowledge of medical waste management is essential for dealing with medical waste. In the current study, a large percentage of the healthcare providers participating were found to have high knowledge of medical waste management. In general, it was found that healthcare providers' knowledge in the studied hospitals is good (91.6%). This is in agreement with the study of (Akkajit et al.,2020), found in the study to assess the level of knowledge of health care providers in Phuket, Thailand, that 89.5% of the participants had a good level of knowledge.

G. RESPONDENTS' ATTITUDES TOWARD MEDICAL WASTE MANAGEMENT

(A and Eshwar,2015) reported that one of the most critical medical waste management skills that influence the quality of work is the self-awareness of healthcare providers. In the current study, health workers' attitudes toward medical waste management in the studied hospitals were high (85.4%). This agrees with the study of (Rudraswamy et al., 2012), conducted in hospitals in Bangalore, India. The researchers found positive attitudes of healthcare providers toward medical waste management. Although the positive attitudes of health workers participating in the current study about medical waste management, healthcare providers asked a question, the hospital does not manage medical waste properly, so what is the benefit of segregating medical waste? The failure of healthcare providers to feel the feasibility of their work in managing medical waste is a problem for the concerned authorities to reach immediate solutions because monitoring and imposing penalties on violators will not solve the problem. However, the process needs to practically and tangibly improve medical waste management, not just ink on paper. (Sylvain et al., 2020) Reported that the negative attitudes of healthcare providers towards medical waste management are due to the work environment, as working conditions in developing countries are not as favorable as in developed countries.

H. RESPONDENTS' PRACTICES TOWARD MEDICAL WASTE MANAGEMENT

In this study, 87.8% of participating health workers had positive practices toward medical waste management. The result of our study is in agreement with the result of (Akajit, 2020) and not in agreement with the result of (Sylvain et al., 2020) that health workers have poor practices towards medical waste management. Whether these positive medical waste management practices result from a sense of responsibility on the part of health workers or due to the supervision of the medical waste management process by infection control or public health teams, positive medical waste management practice is good for the safety of the work system. As it is known, healthcare providers are highly exposed to medical waste due to the nature of their work.

V CONCLUSION

MedicalwasteisgeneratedinBasrahgovernoratehospitals withinthenormallimits, but its quantity is expected to increase due to the lack of plans to reduce it and the rapid population growth in the governorate.Allhealthworkersarevaccinated againstthepatitisBinfection,there areno continuousandregulartrainingcoursesforhealthworkerson medicalwastemanagement,andthere isaconflictinsomedepartments of Basrah governorate hospitals regarding the task ofmanaging medical waste according to the hospital's policy, whichmaylead to work confusion. Theabsence of many aspects of medical waste management inBasrah governoratehospitals, such as the availability of poor

quality medical waste collection containers and bags, the use ofmanualtransfer of medicalwaste, and the lack of sufficient medicalwaste stores that may expose health workers and patients in hospitalstomany risks of medical waste. Healthcare providers have ahighlevel of knowledge, attitudes, and practices regarding medicalwastemanagement, although there is generaldissatisfaction withhospitalpoliciesonmedicalwastemanagement.

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