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The Reality of Medical Waste Management for A Sample of Primary Health Care

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ABSTRACT

Background: The primary health care centers of health institutions that provide important services to citizens living within its geographical area in the form of specialized units, these centers produces daily large amounts of hazardous medical waste, which could negatively impact public health if not handled properly, despite the previous studies dealt with the problem in other cities of Iraq, we could not obtain a study that deals with the problem in the city of Mosul.
Aim of Study: Aims to identify the reality of medical waste management in these health centers,
Method of study: A questionnaire was designed based on guidelines of World Health Organization WHO, this questionnaire was subsequently distributed on the medical and service staff in these centers, and by using some analytic and statistical methods.
Conclusion: The study found that there are a number of negative points as well as several weaknesses in these guidelines implementations. The study calls for intensifying efforts to strengthen guidelines; monitoring the possible health problems that could arise due to weak implementation, and proposes a number of suggestions to improve the management of medical waste in these health centers.

Keywords: Health care center, Medical waste, World Health Organization WHO, Service staff

INTRODUCTION

Medical waste is one of the most important sources and causes of the spread of infection if it is not removed regularly and dealt with in the correct manner, especially in primary health care centers, as it is not the only source of infection, but it is one of the causes that can be avoided, and this can be achieved with a little effort and preparation.

The goal of establishing any hospital, health care center or clinic, regardless of its size, is to be a place for healing and treatment, which is the primary goal of the health care system, but the ability of the health organization to provide a good level of health care may be affected if the level of General hygiene is poor, and the risk of transmission to patients and staff is high, so achieving a good level of hygiene is an important measure to combat infection.

Accordingly, the problem of the study begins in the absence of safe management of this waste disposal in most primary health care centers in the city of Mosul, which reflects negatively on the ability of these organizations to provide the best health services to patients, as well as the exposure of workers in them to the risk of pollution as a result of wrong handling with these Waste. The study problem can be presented through an important question:

1. Do the staff in the PHC centers have sufficient knowledge of what is and the seriousness of medical waste and the screening systems needed to reduce the volume and risk of this waste?
2. How well do health care workers follow the basics of safe handling of medical waste.?
3. Did systematic methods used in the treatment and safe disposal of medical and pharmaceutical waste in these centers without any damage to the surrounding environment?

There are many different concepts used in the definition of medical waste. We review some of them:

1. It is waste produced by organizations that provide different health care, laboratories, drug and drug production centers, vaccines, veterinary treatment centers, research institutions, and from home treatment and nursing. (1)
2. .he World Health Organization defines it as: (the total health care waste, which includes latent waste and non-communicable waste). (2)
3. Medical waste was defined as being: materials consisting mainly of solid and/or liquid waste, where there are various sources, and usually produced through treatment, prevention, diagnosis, and research in human and animal diseases, where every year huge quantities are produced Estimated millions of tons of medical waste from health centers in the world. (3,4)

4. Medical waste is also defined as All waste from the practice of medical and hotel business in various types of health organizations. (5)

Classification of medical waste:
There are many classification systems used to distinguish the different components of medical waste and differ from one country to another or from one organization to another, as the waste generated in health organizations is classified into two main types. (6,7,8,9)

First: Hazardous waste
Hazardous waste is defined as waste that is likely to contain infectious, chemical or radioactive factors. This section is classified into seven categories as follows:

1. Infective waste: It is a waste that can contain pathogens (bacteria, viruses, parasites, or fungi) in sufficient quantities or concentrations to cause an infectious disease in a prepared host. Examples: Laboratory bacterial cultures - Devices in contact with blood - Wound dressings - Wastes from patient isolation units with communicable diseases - Hemodialysis (hemodialysis) devices - Laboratory animals and fermented experiments. etc.

2. Pathological waste: They are human organs, body tissues, dead embryos, animal carcasses, body fluids and blood from patients with infectious diseases.

3. Sharp waste: They are sharp objects that can cause prick or injury to the skin if they come in contact, such as syringe needles, scalpels, an infusion set, and broken glass.

4. Pharmaceutical waste: These are expired and contaminated pharmaceutical products such as vaccines, serum, and drug containers, as well as a group of anti-tumor drugs.

5. Chemical waste: They are wastes that contain chemicals, whether solid, liquid or gaseous in the form of radiographic materials, formaldehyde, solvents, and disinfectants.

6. Compressed gas containers: They are compressed gases for medical use, stored in cylinders. About: anesthetic gases and oxygen.

7. Radioactive waste: It is waste that contains radioactive materials such as, Radioactive nuclides are used to diagnose and treat tumors, and for the purpose of research as well, where radioactive waste is considered hazardous waste.

Second: Non-hazardous waste
It is the one that cannot be exposed to infectious, chemical or radiological hazards and is seen as ordinary waste (household or municipal waste), this section is classified into two categories as follows: (10,11,12).

1. Household and kitchen waste: This type of waste is caused by preparing foods in the kitchen and excess food in patients' rooms, as well as flowers and food packaging, envelops ... etc. This type is generated by medical personnel, patients themselves, or their visitors.

2. Office waste: It includes waste generated in offices such as plain paper resulting from administrative work and cardboard used for packaging.

WHO has indicated There are approximate ratios of the quality of medical waste in health care centers, as follows: (13) (80% non-infectious waste, pathological and infectious waste15%, 1%. sharp tools, 3%. chemicals and pharmaceuticals, Less than 1% pressurized containers and mercury-broken thermometers).

It is clear from all of the above, that it is impossible to ignore the great dangers that medical waste causes, leading to serious and often fatal damage to the person himself, and usually exposes workers in health organizations to infectious diseases, and their transmission to others inside and outside these organizations, as well as the release of materials Harmful and toxic gases to water, sewage, and air. (14,15)

Despite the existence of previous studies dealing with the topic of medical waste in health institutions in other Iraqi cities (16-21), we could not obtain a study that deals with the problem in the city of Mosul, especially in health centers, from here came the idea of this study, which aims to:

1. Giving a clear picture and information about the current reality of medical waste management in health centers and the methods used in that.
2. Studying and analyzing the views of the people involved in the management of medical waste, knowing their directions and needs to determine the existing problem, and trying to reach an appropriate solution.

3. Estimating the needs of those involved in managing medical waste in all its stages in the primary health care centers.
4. Setting the appropriate mechanisms to raise the level of comprehensive awareness in the centers and institutions related to the safety of their employees and the processes that take place inside and the surrounding environment, through fieldwork.
5. Contributing to proposing an acceptable system that can be applied It is cost-effective and environmentally safe to deal with medical waste.
6. Assist in the process of future planning for waste management in primary health care centers.

The study adopted the descriptive and analytical method using the statistical method, and the following provides a review of the procedures adopted in that:

1-: Data collection methods

In order to obtain the data and information necessary to complete the study and reach the results and achieve the goals of the study, the researchers relied on the following methods:

A- Theoretical framework: The two researchers relied on obtaining the required data to cover the theoretical side on many sources represented in the scientific references such as books, studies and official documents of the Nineveh Health

Department and university theses.

B- The field framework: As for the field side, the following methods were used to collect data:

- Personal interviews: The interview was conducted with the individuals of the study sample in order to clarify the questionnaire clauses in the event that this is required to ensure the correct answer, as well as asking indirect questions with a view to taking a general idea of the extent of applying the safe management of medical waste in health centers.
- Questionnaire: The questionnaire form is an essential and important source of data collection, and its formulation has been taken into account its ability to identify important issues related to medical waste management.

The questionnaire consisted of two parts, and a description of its contents follows:

Part one: general information about the respondent: This part concerned me with collecting general information about the respondents and included (Job position, number of training courses related to dealing with medical waste).

Part Two: Proposed phrases on medical waste management to find out what the medical and service staff thinks about these phrases.

Table 1: Parts of the questionnaire

Section	The components	Paragraph numbers in the questionnaire form	Symbols in the body of the study
First	General information about the respondent	2 -1	#
Second	Suggested phrases for waste management	1-26	X1-x26

2- STATISTICAL ANALYSIS METHODS

A set of statistical methods and tools has been relied upon for the purpose of arriving at indicators that serve the objectives of the current study and testing its hypothesis. These methods were represented by iterations, percentages, means and standard deviations.

3- Study limits:

a- **Spatial limits:** This study was conducted in a number of health centers exclusively in the city of Mosul, and these centers are:(Al-Rafidain Primary Health Care Center, Tammuz Model Primary Health Care Center, Al-Zanjili Primary Health Care Center, Al-Quds Center for Primary Health Care, Arabi Center for Primary Health Care, Al Noor Primary Health Care Center).

b- **Temporal limits:** The two researchers initiated this thesis in February 2018 and continued it until June 2018.

c- **Human frontiers:** The questionnaire was submitted to the managers and officials of the medical and service units in the health centers above, as they numbered seventy

Study Sample Description

1. Job title and Educational level of the study sample

Table (2) shows the .job title and Educational level of the study sample, which included workers in health centers examined by doctors, dentists, pharmacists, nurses, and service personnel, as the table shows that the largest category is for those with a bachelor's degree, as well as 20% of doctors from graduates with higher degrees, which is one of the factors The task is to raise the scientific level of health centers.

Table 2: Job title and Educational level of the study sample

Occupation	Numbers	Ph.D.	Master	Diploma	B.Sc.	Prep	Other
A- A doctor	24	3	2	1	18	-	-
B - a dentist	12	-	-	-	12	-	-
A- Pharmacist	2	-	-	-	2	-	-
D- Nurse	26	-	-	-	3	9	14
E - Service Officer	6	-	-	-			6
Total	70	3	2	1	35	9	20

2. Distribution of study sample individuals according to the training courses.

Table (3) shows the distribution of sample individuals according to the training courses, as the percentage of individuals who did not enter any training course in the country (48.57%), and the percentage of individuals who did not enter any training course outside the country (98.57%), while individuals who have courses Training from 1-5 courses, they represented (22.85%) for the courses inside the country, and (1%) for the courses outside the country, and the percentage of individuals who had training courses from 6-10 represented (15.71%) inside the country, and (0%) outside the country, As for individuals who have training courses 10 or more courses, their percentage represented (12.85%) inside the country, and (0%) for courses outside the country, and this indicates that the largest group of individuals in the study sample have never entered training courses inside the country, while courses outside the country are almost non-existent.

Table 3: Distribution of study sample individuals according to the training courses

	Inside the country		Outside the country	
Number of cycles	Repetition	%	Repetition	%
Nothing	34	48.57	69	98.57
From 1-5	16	22.58	1	1.42
6-10	11	15.15	0	0
11 and over	9	12.85	0	0
Total	70	100	70	100

Description and diagnosis of study variables

The following tables show the frequency distributions, percentages, mathematical mean, and standard deviations of the research variables, as ... X1, X2, X3 represent the statements presented to the health center staff as follows:

Knowledge Fixing and Sorting System: see Table (41.)

X1: Is there a guide for workers on safe handling of medical waste?
X2: Guidance boards are prominent in sections?
X3: Is there a special committee responsible for medical waste in the health center?
X4: The generated waste is sorted according to the color index (for each container having its own color) in all departments?
X5: Chemical wastes are sorted and collected in suitable packages that are not reachable to them?
X6: Broken thermometers and pressure gauges are sorted?

Table 4: Frequency distributions, percentages, mean, and standard deviations for knowledge stabilization and screening system

Sequence of questions	Response measurement										Arithmetic mean	Standard deviation
	Strongly agree		Agree		Neutral		I do not agree		Strongly disagree			
	No.	%	No.	%	No.	%	No.	%	No.	%		
X1	1	1.4	11	15.7	1	1.4	33	47.1	24	34.3	2.028	1.062
X2	0	0	10	14.3	4	5.7	24	34.3	32	45.7	1.885	1.043
X3	0	0	21	30.0	9	12.9	23	32.9	17	24.3	2.485	1.163
X4	0	0	26	37.1	4	5.7	12	17.1	28	40.0	2.400	1.344
X5	5	7.1	21	30.0	9	12.9	15	21.4	20	28.6	2.657	1.360
X6	0	0	8	11.4	7	10.0	26	37.1	29	41.4	1.914	0.988
Overall index	1.416		23.083		8.1		31.65		35.716		2.228	1.16

Table 4 data at the level of the overall indicator show that an average of (67.366%) of the responses were score (I do not agree, do not agree strongly), while the agreement in the answers reached (24.499%), and this indicator scored an arithmetic mean (2.228) with a standard deviation (1.16), and among the most variables that contributed to the lack of positivity of this indicator (X2. X6), where X2 represents the lack of indicative panels in the sections, and X6 represents the failure to sort out the thermometers and broken pressure gauges, showing the total indicator that we obtained on the lack of availability The determinants of establishing knowledge of medical waste in health centers due to the absence of indicative awareness for affiliates, and the necessary screening systems are not applied to it Q separation of medical waste from regular waste, and there is a committee responsible for medical waste in these centers.

2 Plastic bags and packages: see Table (5).

X7: Bags have a suitable thickness?
X8: Plastic bags and packages are made of high-quality plastic?
X9: Waste bag containers have a tight lid?
X10: Bag capacity is proportional to the volume of waste generated?
X11: Plastic packaging for sharp waste (such as needles and surgical blades) is appropriate? and not open?
X12: Bags and packages are only filled to two-thirds of the volume
X13: Packages and bags are available in sufficient numbers in the compartments?

Table 5: Iterative distributions, percentages, mean, and standard deviations of plastic bags and packages

Sequence of questions	Response measurement										Arithmetic mean	Standard deviation
	Strongly agree		Agree		Neutral		I do not agree		Strongly disagree			
	No.	%	No.	%	No.	%	No.	%	No.	%		
X7	2	2.9	23	32.9	9	12.9	29	41.4	7	10.0	2.771	1.105
X8	6	8.6	11	15.7	17	24.3	24	34.3	12	17.1	2.642	1.192
X9	16	22.9	21	30.0	0	0	24	34.3	9	12.9	3.157	1.440
X10	6	8.6	16	22.9	5	7.1	13	18.6	30	42.9	2.357	1.444
X11	0	0	29	41.4	0	0	25	35.7	16	22.9	2.600	1.244
X12	0	0	7	10.0	27	38.6	24	34.3	12	17.1	2.414	0.892
X13	15	21.4	24	34.3	4	5.7	21	30.0	6	8.6	3.300	1.333
Overall index	9.2		26.742		12.657		32.657		18.785		2.748	1.235

Table (5) data shows that at the level of the overall index, an average of (51.442%) of the answers are of a degree (not agree, do not agree strongly), while the agreement in the answers reached (35.942%), and this indicator scored an arithmetic mean (2.748), and with a standard deviation (One of the variables that contributed to the lack of positivity of this indicator (X10. X12), where X10 represents the incompatibility of the size of the bags with the volume of waste generated, and X12 represents the non-filling of bags up to two-thirds of the volume, though the overall index we note that the bags used to store waste Available in sufficient numbers, but not with the appropriate thickness, as well as not being appropriate for the volume of waste and filling more than required, which exposes it to completion. S more often, as well as note that the waste containers do not have blankets court there are no dedicated containers sharp waste (which is always classified as hazardous waste) but placed with the rest of the waste Which affects the sorting process.

3. **Primary treatment:** see Table (6)

X14: Preliminary treatment of highly contaminated waste is carried out before disposal (Chemical disinfection, Autoclaving Microwave irradiation disinfection)?

X15: effluent treated in the health center before it is put out?

Table 6: Frequency distributions, percentages, mean, and standard deviations for primary treatment

Sequence ofquestions	Response measurement										Arithmetic mean	Standard deviation
	Strongly agree		Agree		Neutral		I do not agree		Strongly disagree			
	No.	%	No.	%	No.	%	No.	%	No.	%		
X7	9	12.9	5	7.1	12	17.1	33	47.1	11	15.7	2.542	1.223
X8	5	7.1	11	15.7	16	22.9	28	40.0	10	14.3	2.614	1.133
Overall index	10		11.4		20		43.55		15		2.578	2.356

It is clear from the data of Table (6) at the level of the overall indicator that an average of (58.55%) of the answers is a degree (do not agree, do not agree strongly) while the agreement in the answers reached (21.4%), and this indicator has recorded an arithmetic mean (2.578) And with a standard deviation (2.356), one of the variables that contributed to the lack of positivity of this indicator (X14), where the absence of X14 represents the presence of a primary treatment for medical waste, the overall indicator shows that the health centers examined do not use the primary treatment method for medical waste because of the lack of necessary technology for that Also, we note the non-positive indicator (X15), which represents the treatment of laboratory liquid wastes.

Collection and transportation within the health center: see Table (7).4.

X16: Is there a specific mechanism for collecting and transporting waste to the storage site?

X17: Does the waste remain in the place of generation for more than one day?

X18: A label is placed on bags and packages?

X19: A new package/bag is replaced instead of the one moved immediately?

X20 Transport containers or trolleys easy for loading and unloading?

X21: Are there workers dedicated to transporting medical waste?

X22: Provide workers with appropriate personal protective equipment?

Table 7: Frequency distributions, percentages, mean, and standard deviations for collection and transportation within a health center

Sequence of questions	Response measurement										Arithmetic mean	standard deviation
	Strongly agree		Agree		Neutral		I do not agree		Strongly disagree			
	No.	%	No.	%	No.	%	No.	%	No.	%		
X16	3	4.3	25	35.7	2	2.9	23	32.9	17	24.3	2.628	1.309
X17	15	21.4	18	25.7	13	18.6	11	15.7	13	18.6	3.157	1.420
X18	0	0	9	12.9	2	2.9	28	40.0	31	44.3	1.842	0.987
X19	17	24.3	17	24.3	12	17.1	21	30.0	3	4.3	3.342	1.261
X20	3	4.3	24	34.3	2	2.9	15	21.4	26	37.1	2.471	1.401
X21	4	5.7	4	5.7	9	12.9	26	37.1	27	38.6	2.028	1.128
X22	0	0	4	5.7	0	0	59	84.3	7	10.0	2.014	0.577
Overall index	8.571		20.614		8.185		37.342		25.314		2.497	1.154

Table (7) data shows that at the level of the overall indicator, an average of (62.656%) of the answers is a degree (I do not agree, I do not agree strongly), while the agreement in the answers reached (29.185%), and this indicator scored an arithmetic mean (2.497) with a standard deviation (1.154), and among the most variable that contributed to the lack of positivity of this indicator (X18), X18 represents the absence of labeling on the bags, the overall indicator shows that there is no specific mechanism for collecting and transporting waste in these centers, which leads to the waste remaining for long periods in the places of its generation Please, despite the fact that new bags are put in place of transported immediately, no identification cards are placed on waste bags due to lack of availability, also the presence of workers are allocated for the transfer of medical waste and the service staff of this task and they are not equipped with personal protective equipment due to unavailability.

Final treatment and disposal: see Table (8)5.

X23: Burning medical waste inside the health center is avoided?
X24: Waste health center is sent to special places for central burning?
X25: Are there regular incinerators for burning health center waste?
X26: Liquid medical waste is treated before being discharged to the sewage network?

Table 8: Iterative distributions, mean, and standard deviations for final treatment and disposal

Sequence of questions	Response measurement										Arithmetic mean	standard deviation
	Strongly agree		Agree		Neutral		I do not agree		Strongly disagree			
	No.	%	No.	%	No.	%	No.	%	No.	%		
X23	11	15.7	2	2.9	25	35.7	11	15.7	21	30.0	2.585	1.367
X24	12	17.1	3	4.3	10	14.3	33	47.1	12	17.1	2.571	1.314
X25	13	18.6	6	8.6	11	15.7	26	37.1	14	20.0	2.685	1.388
X26	0	0	7	10.0	9	12.9	15	21.4	39	55.7	1.771	1.023
Overall index	12.85		6.45		19.65		30.325		30.7		2.403	1.273

Table (8) data shows that the overall indicator level is an average of (61.025%) of the answers with a degree (do not agree, do not agree strongly) while the agreement in the answers reached (19.3%), and this indicator scored a mathematical mean (2.403) with a standard deviation (1.273), and among the most variable that contributed to the lack of positivity of this indicator (X37), since X37 represents the absence of treatment for liquid medical waste before it is discharged to the sewage network, this indicator shows the use of on-site burning methods inside the health center, despite the presence of an automatic incinerator In the center of light and another crematorium made of bricks in the center of Arabia, but these crematoria do not meet the required conditions, such as a scale Heat, treatment of gases and fumes that are leaking into residential homes and neighboring schools, as well as not conducting any treatment for liquid waste(Such as acids that are used in the radiation, and laboratory-generated effluents, etc.), but they are discharged directly to the sewage network due to the lack of necessary devices and equipment.

The overall indicators of the previous tables do not achieve the overall positive in the application of medical waste management in the primary health care centers, and thus it can be said that the final indicators of the opinions of the medical and service staff in these centers were fulfilling the three assumptions of the study.

RESULTS

Through our analysis of the data we obtained from the questionnaire form and personal interviews, we can find some of the following results:

1. Lack of clear knowledge among most workers in health centers about what medical waste is, its classification and the severity of unsafe handling with it, due to the following reasons:
   A- The absence of a guide in health centers to introduce members of the medical waste and its different types and the steps for proper management of this waste.
   B- Most health centers do not have guidance boards or directive clarifications to educate affiliates and patients about the danger of medical waste.
   C- Most of the employees have never entered training courses or attended conferences or seminars dealing with the topic of medical waste and its management in health organizations.
2. Most health centers do not have a special committee responsible for medical waste, or a responsible person authorized by the director of the health center.
3. Most health centers do not follow the waste sorting system according to their categories, but regular and office waste is collected with medical waste from syringes, empty vaccine boxes, dressings, pressure devices, thermometers, and others in containers.
4. The plastic bags and packages used for the waste are available in sufficient quantities, but they do not have a good thickness or quality, which exposes them to tearing in most cases.
5. Health centers lack the primary treatment system for medical waste, as this waste is disposed of without any kind of treatment on it for the purpose of reducing its size and risks.
6. There is no specific mechanism for collecting and transporting waste to the storage site, in addition to keeping waste in the places it generates for several days and not to place the label on bags and packages.
7. There are no workers dedicated to transporting medical waste, as service personnel perform this task and are not equipped with personal protective equipment and do not have containers or vehicles that are easy to load and unload.
8. Lack of suitable sites for storing waste in terms of area, provisions, and independence from other centers of the center, and waste remains in these locations for long periods, in addition to not cleaning these sites and cleaning them on a daily basis.
9. Health center waste is transported by municipal vehicles designated for transporting household waste.
10. In most health centers, medical waste is burned in municipal containers or in irregular incinerators, which causes smoke emissions and escalation of gases and fumes polluting the surrounding environment, as well as incomplete combustion of these wastes, which leads to the survival of infectious germs that require very high temperatures to eliminate On it, as well as the effluent discharge to the sewage network directly without treatment.
11. In most health centers, injury records and vaccination records for medical personnel and workers are not available for diseases resulting from dealing with waste.

RECOMMENDATIONS

Through studying the current reality of medical waste management in primary health care centers, the researcher suggested setting an integrated system for managing medical waste from its source until the final disposal of it so that it includes the following:

1. The necessity of a clear definition of medical waste, and detailing it in each section of health centers.
2. Educating all workers in health centers about the dangers that may arise from dealing with medical waste, and providing appropriate means and tools that reduce these risks.
3. The appropriate distinction, confirmation of knowledge and good separation of medical waste from regular waste, by following the proper foundations, while providing all the special requirements for that.

4. Treating medical waste in terms of collection, internal transportation, and storage practices in a safe, effective and cost-effective manner.
5. Replace the burning method currently used in health centers with environmentally friendly treatment methods, because they are environmentally inappropriate because of the presence of these centers within the population distribution within the city.
6. Primary treatment of medical waste inside health centers, by appropriate methods, and until such modern methods of treatment are available, the health center waste must be transported by vehicles intended to transport medical waste to central incinerators outside the city to reduce its environmental impact.
7. Record information about medical waste and keep it in special records.
8. Providing appropriate training for all workers in health centers (especially outside Iraq) due to the lack of advanced training centers in Iraq, all in proportion to the nature of its treatment or its relationship to medical waste.
9. Follow the principles of public health and safety, such as examining workers in health centers before employment, and giving them the necessary vaccinations, with the need to make everyone aware of the importance of this.
10. Educating all workers in health centers about the importance of the role of cleaners in them, and providing them with personal protective equipment while directing everyone to the importance of treating them with kindness and respect, so that they feel their belongingness to the institutions in which they work so that they can do their work in the best way.

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