Occupational Health Hazards among Workers Dealing with Medical Waste Disposal in Outpatient Clinics

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Abstract

Background: Medical Waste disposal workers are continually exposed to occupational health hazards. **Aim:** The aim of the study is to assess occupational health hazards among workers dealing with medical waste Disposal in outpatient clinics. **Research design:** A descriptive explanatory design used to conduct this study. **Setting:** The study was conducted at outpatient clinic at family medicine centers. **Subjects:** A convenient sample of 250 workers who dealing with medical waste. **Tools:** Two tools were used for data collection; 1st tool, interview questioner sheet consist of four part; demographic data of the studied workers, knowledge about medical waste and occupational health hazards, workers medical history and exposure to occupational health hazards. 2nd tool, Observational checklist to evaluate the medical waste workers practice and environmental workplace. **Results;** the study finding revealed that, 83.2% of them were exposed to biological hazards, 95.2% of them were exposed to physical hazards., 71.2% of them were exposed to psychological hazards. Furthermore 87.2% of the studied samples have unsatisfactory level of total knowledge; also 84.0% of the studied sample have inadequate level of total practice. There was highly significant positive correlation between total knowledge and total practice regarding medical waste management among studied sample at P= < 0.01. **Conclusion:** the present study concluded that, the most of study workers exposed to biological, physical and psychological hazards. The current study also clarified that most of study workers who dealing with medical waste have unsatisfactory knowledge. The present study showed also the most of the study workers dealing with medical waste has inadequate level of total practices. Also, most of the work place environment (temporary storage room of medical waste) not standard. The current study showed that there is highly significant relation between socio-demographic data and their knowledge as well as that there is highly significant relation between the total knowledge and total practice. **Recommendation:** Providing continuous educational programs and on-job training for all workers who dealing with medical waste to improve their performance when dealing with medical waste.

Keywords: Occupation Health, Hazards, Medical Waste Disposal, Workers.

Introduction:

Occupational hazard is a hazard experienced in the workplace; it can encompass many types of hazards, including chemical hazards, biological hazards (biohazards), psychosocial hazards, and physical hazards **(MOH, 2017).**

Medical waste is any kind of waste that contains infectious material (or material that's potentially infectious). This definition includes waste generated by healthcare facilities like physician's offices, hospitals, Primary health medicine, dental practices, laboratories, medical research facilities, and veterinary clinics **(Patil & Pokhrel, 2017).**

Medical waste management means the management of waste produced by health care facilities using techniques that will check the spread of diseases. Health care facilities are the place where infectious and non-infectious healthcare waste is being generated due to the provision of medical care services to the patients **(Kralj and Stamenkovic, 2018).**

The most common waste categories include: Hazardous waste like Infectious Waste, Anything infectious or potentially infectious goes in this category, including swabs, tissues, excreta, equipment, and lab cultures. Sharps waste. This kind of waste includes anything that can pierce the skin, including needles, scalpels, lancets, broken glass, razors, ampules, staples, wires, and trocars.

Chemical, Radiological and pharmaceutical waste are considered from hazardous waste. Non-hazardous waste also called, Regulated Medical Waste. This type doesn't pose any particular chemical, biological, physical, or radioactive danger **(Sheila, 2019).**

The hazardous nature of medical wastes is due to infectious agents, toxic or hazardous chemicals, pharmaceuticals, sharps, genotoxic and radioactive. In developing countries, knowledge, attitude and practices regarding hospital waste management in terms of its segregation, collection, storage, transportation and disposal is lacking **(AC Woolridge et al., 2018).**

The improper management of medical waste causes Occupational health hazards for workers who dealing with medical waste and causes a serious environmental problems in terms of air, water and land pollution. One of the cusses for the increase in infectious diseases is improper waste management. Blood, body fluids and body secretions which are constituents of bio-medical waste harbour most of the viruses, bacteria and parasites that cause infection. In addition, mismanaged waste such as sharps contaminated with blood facilities transmission of infections such as hepatitis B, hepatitis C, HIV, AIDS and other viral infections **(KK padmanabhan, Debabrata, (2019).**

Aim of the Study:

The aim of the study is to assess occupational health hazards among workers dealing with medical waste in outpatient clinics.

Research Question:

What are the occupational health hazards among worker dealing with medical waste disposal?, What are the medical waste workers knowledge about occupational health hazards and medical waste management?, What are the medical waste workers practices toward medical waste management? And Is the relation between Socio-demographic characteristics of medical waste workers and their knowledge?

Subjects and Methods

Technical Design:

Research Design:

A descriptive explanatory research design was employed to fulfill the aim of the study and answer the research question.

Research Setting:

The study was conducted in outpatient clinics at Family Medicine Centers of the Directorate of health Affairs in Cairo Governorate, which included (136) centers. Chosen 50% of them. Those biggest centers contain the large number of clinics (medical clinics, surgical clinics, dental clinics, obstetric clinic, and pediatric clinic) and contain many services.

The study was conducted at outpatient clinics in family medicine centers of the directorate of health affairs in Cairo governorate, which included (136) centers. Chosen (50%) of them.

Subjects:

A convenient study sample was employed; it included 250 workers who were working at the previously mentioned settings, regardless of their characteristics. The sample size was calculated according to the number of nurses working at each unit using EPI program (confidence level 95%).

Tools for data collection:

Data were collected using the following tools:

Tool I: An Interview Questionnaire Sheet:

It was designed by the researcher in Arabic language after reviewing the recent and relevant literature, and consisted of two parts:

First Part:

This part was concerned with Demographic and work characteristics of medical waste workers which include (age, gender, marital status, educational level, years of experiences, department and attendance of training course.

Second Part:

Medical history of medical waste disposal workers.

Third Part:

This part was designed to assess data related to the medical waste workers knowledge about medical waste

❖ **Scoring System:-**

The workers answers were cross-checked with a model key answer prepared by the researcher. A correct answer was scored "1", while "0" was given for an incorrect answer or "don't know". After wards, the total studied workers' knowledge was categorized into two levels: satisfactory level of knowledge (score ≥60%) and unsatisfactory (score<60%).

Fourth Part:

This part was Adopted from WHO, 2019. designed to Assess data related previous exposure to any types of occupational health hazards related medical waste disposal included (have experienced any type of occupational hazards, what was the cause, what is the post exposure practice).

❖ **Scoring System:-**

The workers answers were cross-checked with a model key answer prepared by the researcher. A correct answer was scored "2", while "1" was given for an incorrect answer. After wards, the total studied workers' knowledge was categorized into two levels: Exposure (score ≥60%) and Not exposure (score<60%).

Tool II: An observational checklist

Adopted from CDC, 2020 and (national infection prevention and control manual, ministry of health and population, 2020 and after reviewing the recent literature and it will include the following two parts.

First Part:

This tool was designed by the researcher Accordingly, the national infection prevention and control manual, ministry of health and population, 2020 and Centers for Disease Control and Prevention, 2020 to evaluate the Medical waste workers practice. Include (Apply Universal precautions when dealing with medical waste, separation of medical waste according its types, safe methods of sharp and liquid medical waste disposal, and safe methods of transportation of wastes both inside and outside,

❖ **Scoring System:-**

Upon evaluation of medical waste workers practice by the researcher, each item was scored "0" for "Not Apply" and "1" for "Apply". Accordingly, the total evaluation of the Medical waste workers practice .Was categorized into: Inadequate score less than 60%and Adequate score 60% or more.

Second Part:

This tool was designed by the researcher Accordingly, the national infection prevention and control manual, ministry of health and population, 2020 and Centers for Disease Control and Prevention, 2020 and WHO, 2020 to assess the work environment (temporary storage room) for medical waste in outpatient at Family Health Medicine centers include: (standards of temporary storage room, appropriate temperature of temporary storage, appropriate storage.

❖ **Scoring System:**

Upon evaluation of the temporary storage room for medical waste by the researcher, each item was scored "0" for "Not" and "1" for "yes". Accordingly, total standard items of the temporary storage room for medical waste were categorized into: Standard 60%

Non-standard less than 60%

Operational design:

The operational design of this study included preparatory phase, validity and reliability of the developed tools, pilot study, field work, and ethical and administrative considerations.

A) Preparatory phase:

It included reviewing the recent and relevant literatures covering various aspects of the study problem using books, articles, periodicals, magazines and internet in order to get acquainted with the various aspects of the research problem and to develop the required tools for data collection.

Tools validity and reliability:

The developed study tools were tested and evaluated for their validity and reliability by five experts in pediatric nursing department, Faculty of Nursing, Ain Shams University.

The experts' elicited responses were either "agree", "Disagree" or "agree with modifications".

The developed tools were modified according to the experts' opinion. These modifications were in the form of omission or addition of some questions or rephrasing some statements.

Alpha Chronbach Test was used to measure the internal consistency of the tools used in the current study. The internal consistency was measured to identify the extent to which the items of the tools measured the same concepts and correlated with each other. For reliability, test-retest was done (0.84).

B) Pilot study:

The pilot study involved six nurses (10% of total sample size), to ensure the clarity of questions and applicability of the tools, and to determine the time needed to fill the study tools. Minor modifications were done after the pilot study. The nurses involved in the pilot study were not excluded from the study sample.

Ethical consideration:

Ethical approval was obtained from the Scientific Research Ethical Committee of the Faculty of Nursing, Ain Shams University. In addition, oral consent was obtained from every participant who agreed to share in the study. The participants were assured that anonymity, confidentiality and the right to withdraw from the study at any time would be guaranteed. Ethics, values, cultural backgrounds and beliefs were respected.

Administrative design:

An official approval to carry out the study was obtained through an issued letter from the Dean of the Faculty of Nursing, Ain Shams University to the Director of Directorate of health Affairs in Cairo Governorate.

Field work:

The actual field work and data collection was achieved throughout a period of four months; from the first of May 2022, till the end of August 2022. The data were collected at each study setting by rotation during morning and afternoon shifts.

The researcher interviewed individually the Workers who agreed to participate in the study. The researcher explained the aim and objectives of the study to each worker.

The study tools were filled by the researcher, and each worker took 20-30 minutes to fill the tools at the end of the work shift.

The workers were assessed using Tool I, and Tool II were filled by the researcher according to national gridline of infection prevention and control, 2020.

Statistical design:

The collected data were organized, coded and analyzed by using appropriate statistical significant tests. The statistical analysis of data was done by using the Statistical Package for Social Science (SPSS), version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation. Qualitative data were expressed as frequency and percentage.

Results:

Table (1): shows that, (50.8%) of the studied sample their age ranged between ≥ 45 years, the Mean SD of age is42.05 ± 8.31years. As regard to sex and marital status,(80.8%and 90.0%) of the studied sample are male and married ,respectively. Also, (58%) of them has preparatory education. Moreover, (45.2%) of the studied sample have ≥ 15 years of experience, the Mean SD of years of experience is 13.7 ± 6.97years. Furthermore, (4.8%) of the studied sample attending training programs on the safe handling of medical waste, (50%) of them attending course about handling and transporting of medical waste and (83.3%) of them attending one course.

Figure (1): Shows that, (34%) of them working at surgical clinic. Also, (28%) of them working at medicine clinic. Also (22.8%) Dental clinic.

Table (2): displays that, (39.2%) of the studied sample have history of chronic diseases, (80.6% and 67.6%) of them suffered from hypertension and hepatitis C, respectively, and (90.7% and 77.8%) of them suffer from a chronic disease after joining work and take medication regularly. Moreover, (18.4%) of the studied sample have surgical history. Also, (20.8%) of the studied sample were vaccinated against hepatitis B virus, (84.6%) of them take three doses and (100%) of them were vaccinated through the infection control program at their center.

Figure (2): shows that, 88.4% of the studied sample was exposed to biological hazards. Also, 52% of them were exposed to chemical hazards. Moreover, 95.2%of them were exposed to physical hazards. Furthermore, 71.2% of them were exposed to psychological hazards.

Figure (3): shows that, 96.4% of the studied sample an exposed to at least one type of occupational health hazards. While, 3.6% of them not exposed to any occupational health hazards regarding medical waste disposal.

Figure (4): shows that, 92.0% of the studied sample have unsatisfactory level of total knowledge about management of medical waste, and 84.8% definition and types of occupational health risks, respectively. Also, 89.6% of them have unsatisfactory level of total knowledge about post-exposure actions.

Figure (5): shows that, 87.2% of the studied sample has unsatisfactory level of total knowledge about medical waste management and occupational health hazards. While, 12.8% of them have satisfactory level of total knowledge.

Figure (6): shows that, (92.0%) and (91.4%) of the studied sample have Inadequate level of total practice regarding apply universal precautions and hand washing technique, respectively. Also, (87.2% and 84.0%) of them has Inadequate level of total practice regarding sorting and handling and transporting, respectively. Moreover, (55.2% and 68.8%) of them have Inadequate level of total practice regarding interim storage and treatment and final disposal, respectively.

Figure (7): shows that, 84.0% of the studied sample have inadequate level of total practice regarding medical waste management. While, 16.0% of them have adequate level of total practice.

Figure (8): shows that, 82.8% of the temporary storage room are standard related to standard of environmental structure. While, 17.2% of them are non-standard.

Table (3): indicate that, there was highly significant positive correlation between total knowledge and total practice regarding medical waste management among studied sample at = < 0.01.

Table (4): show that, there were a highly statistically significant relation between the studied sample knowledge about medical waste management and occupational health hazards and their education level, years of experience and attendance of pervious seminar /training programs at P= < 0.01. Also, there was statistically significant relation with their sex and marital status at = > 0.01.

Table (1): Frequency distribution of the studied sample according to their demographic characteristics **(n = 250).**

Demographic characteristics		No.	%
Age (years)			
18-<25		18	7.2
25-<35		35	14.0
35-<45		70	28.0
≥ 45		**127**	**50.8**
Mean ± SD	**42.05±8.31**		
Sex			
Male		**202**	**80.8**
Female		48	19.2
Marital status			
Single		25	10.0
Married		**225**	**90.0**
Education level			
Illiterate		30	12.0
Primary education		52	20.8
Preparatory education		**145**	**58.0**
Secondary education		23	90.2
High education		0	0.0
Years of experience			
< 5 years		20	8.0
5 -< 10 years		32	12.8
10 -< 15 years		85	34.0
≥ 15 years		**113**	**45.2**
Mean ± SD	**13.7 ± 6.97**		
Attended previous seminars/training programs on the safe handling of medical waste			
Yes		12	4.8
No		**238**	**95.2**
If yes, what training courses have you attended? (n=12)			
Hand washing		2	16.7
Handling and transporting		**6**	**50.0**
Use personal protective equipment		4	33.3
If yes, how manytraining courses have you attended? (n=12)			
One		**10**	**83.3**
Two		2	16.7

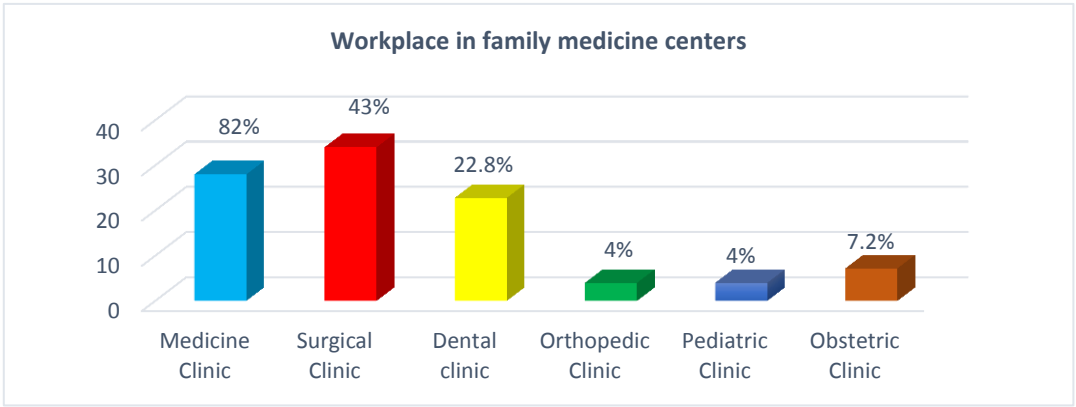

Figure (1): Percentage distribution of the studied sample according to their workplace in family medicine centers **(250).**

Table (2): Frequency distribution of the studied sample according to their medical history **(n = 250).**

Medical history of the medical waste workers	No.	%
History of chronic diseases		
Yes	**108**	**39.2**
No	142	60.8
***If yes, what are the diseases? (n=108)**		
Hypertension	**87**	**80.6**
Hypotension	4	3.7
Diabetes mellitus	70	64.8
Bronchial Asthma	8	7.4
Hepatitis C	**73**	**67.6**
Hepatitis B	23	21.3
Heart diseases	42	38.9
Kidney diseases	5	4.6
Common cold	16	14.8
Cancer	6	5.6
If yes, when was the disease? (n=108)		
Before joining work	10	9.3
After joining work	**98**	**90.7**
Do you take medication regularly?(n=108)		
Yes	**84**	**77.8**
No	24	22.2
Surgical history		
Yes	**46**	**18.4**
No	204	81.6
Have you been vaccinated for hepatitis B virus?		
Yes	**52**	**20.8**
No	198	79.2
If yes, how many doses of vaccination did you take against hepatitis B? (n=52)		
One dose	0	0.0
Two doses	8	15.4
Three doses	**44**	**84.6**
If yes, have you been vaccinated through the infection control Program at your center? (n=52)		
Yes	**52**	**100.0**
No	0	0.0

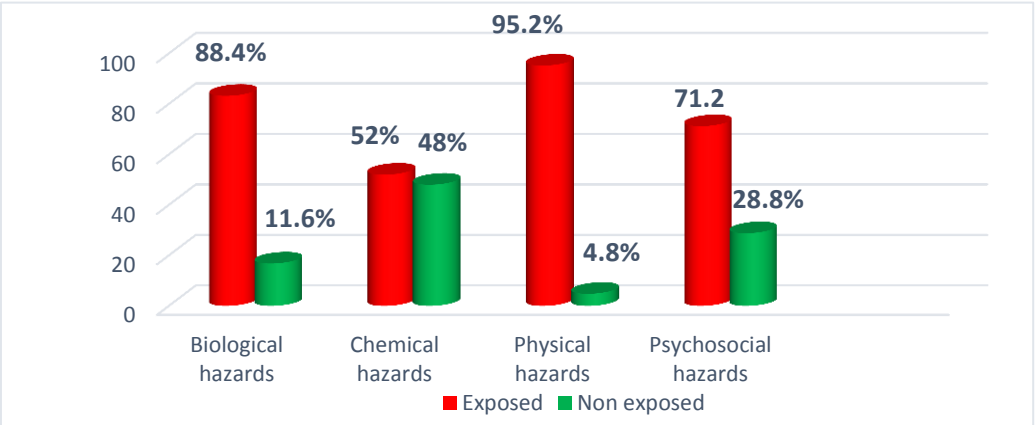

Figure (2): Percentage distribution of the studied sample according to their history of previous exposure to occupational health hazards related medical waste disposal **(n = 250).**

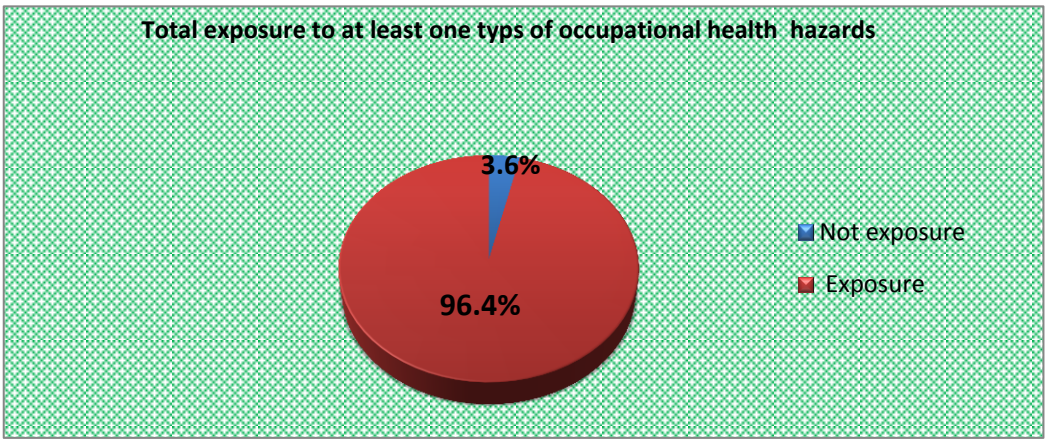

Figure (3): Percentage distribution of the studied sample according to their total exposure to occupational health hazards. (n = 250).

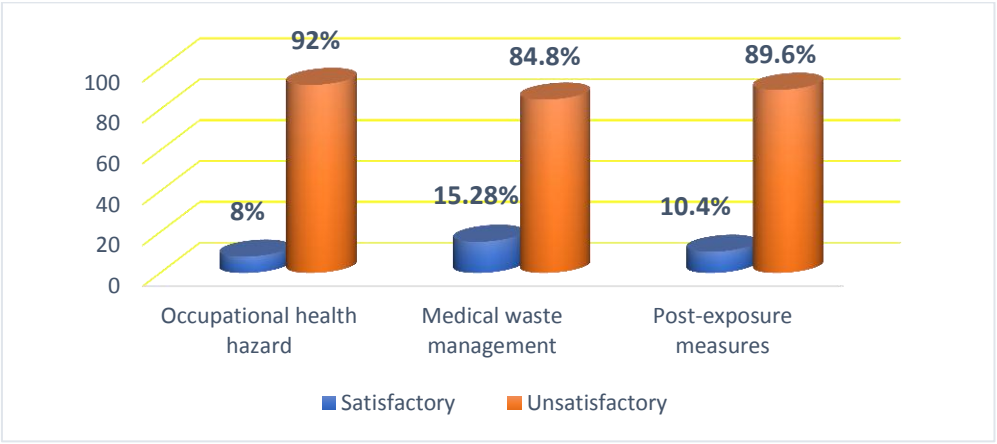

Figure (4): Distribution of the studied sample according to their total subscales of knowledge about medical waste management and occupational health hazards (n = 250).

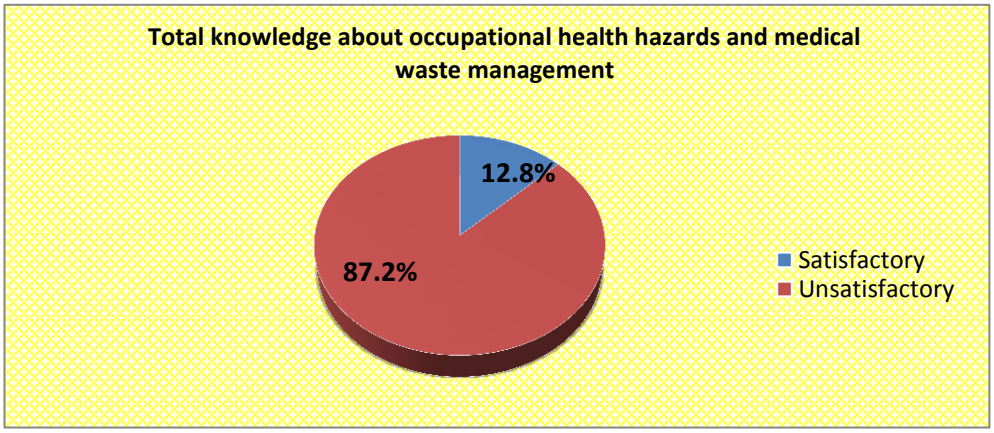

Figure (5): Percentage distribution of the studied sample according to their total knowledge about medical waste management and occupational health hazards **(n = 250).**

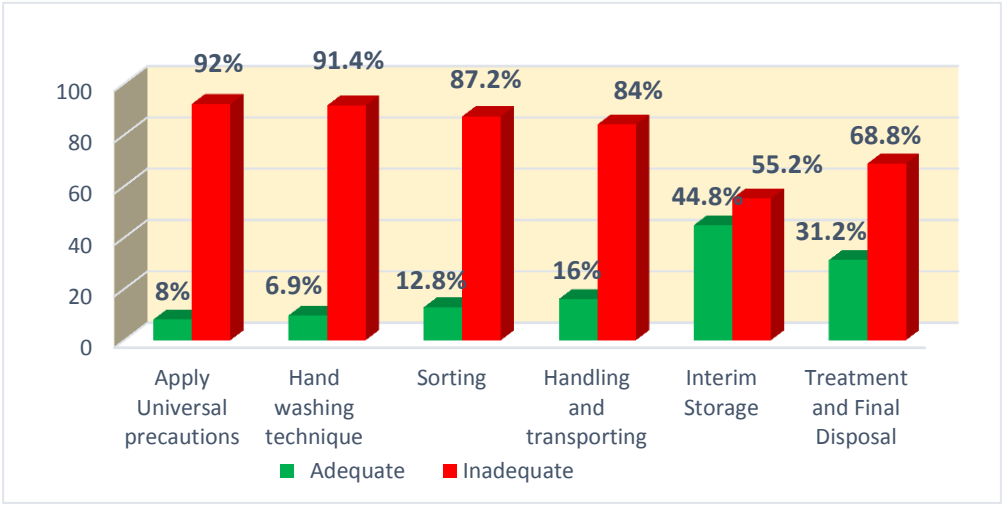

Figure (6): Percentage distribution of the studied sample according to their total subscales of practice regarding medical waste management **(n = 250).**

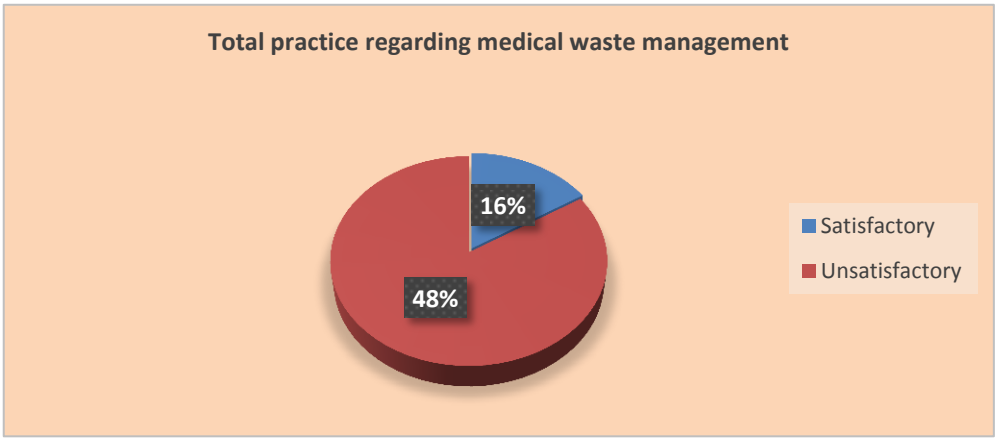

Figure (7): Percentage distribution of the studied sample according to their total practice regarding medical waste management **(n = 250).**

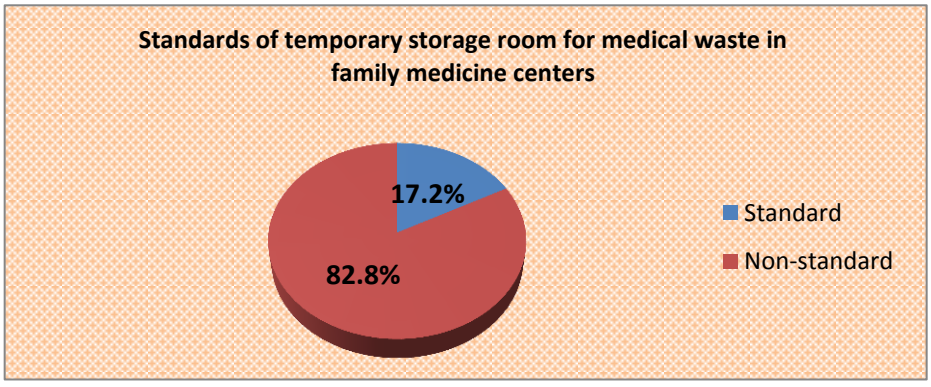

Figure (8): Percentage distribution of the ambulatory units according to standard of temporary storage room for medical waste. (**n=58).**

Table (3): Relationship between demographic characteristics of the studied sample and their total knowledgeabout medical waste management and occupational health hazards (n = 250).

Demographic characteristics		Total knowledge				X2	P-Value
		Satisfactory (n=32)		Unsatisfactory (n=218)			
		No.	%	No.	%		
Age (years)	18-< 25	0	0.0	18	8.3	11.33	0.027*
	25-<35	5	15.6	30	13.8		
	35-<45	10	31.3	60	27.5		
	≥ 45	17	53.1	110	50.4		
Sex	Male	22	68.7	180	82.6	2.466	0.194
	Female	10	31.3	38	17.4		
Marital status	Single	7	21.9	18	8.3	1.259	0.235
	Married	25	78.1	200	91.7		
Education level	Illiterate	0	0.0	30	13.8	15.70	0.000**
	Primary education	2	6.2	50	22.9		
	Preparatory education	10	31.3	135	61.9		
	Secondary education	20	62.5	3	1.4		
Years of experience	< 5	0	0.0	20	9.2	14.37	0.001**
	5 -< 10	2	6.2	30	13.8		
	10 -< 15	10	31.3	75	34.4		
	≥ 15	20	62.5	93	42.7		
Attended previous seminars/training programs	Yes	12	37.5	0	0.0	14.90	0.001**
	No	20	62.5	218	100		

X2 =chi-square test. No significant at p > 0.05.*Significant at p ‹ 0.05.
** **Highly significant at p ‹ 0.01.**

Table (4): Correlation between total knowledge and total practice regarding medical waste management among studied sample (n=250).

Items	Total practice
Total knowledge	r = 0.796 P = 0.000**

r= correlation coefficient test. P= p-value**highly significant at p ‹ 0.01.

Discussion

Mismanagement of hospital waste implies a combination of improper handling of waste during generation, collection, storage, transport and treatment. Improper handling comprises several unsafe actions, such as handling without personal protective equipment (PPE), poor storage (e.g. high temperature conditions combined with prolonged storage times before treatment), manual transport for longer distances, use of uncovered containers instead of closed plastic bags, etc. Other examples include exposure times beyond acceptable limits, lack of worker and equipment decontamination procedures, etc., all of which affect medical waste workers in different ways **(Win et al., 2019).**

Part (I): Demographic and work characteristics of medical waste workers.

Regarding to characteristics of studied medical waste workers, the finding of the study showed that half of them were at the age 45 years and above with mean age **42.05±8.31**years and **80.8%** of them were males. And **90%** of them married **(Table1).** This finding was agreed with ***P Akkajit, et al, (2020)*** who conducted study entitled "Assessment of knowledge, attitudes, and practices in respect of medical waste management in clinics" that found there are no significant differences between medical waste workers age, sex and marital status. there are no significant differences between medical waste workers age, sex and marital status.

As regarding the educational level of studied medical waste workers, the result of the

study reveals that about (**58.0%)** of them have preparatory education and (20%) of them primary school (**Table 1).** This finding was disagreed with ***Deress et al, (2019)*** who conducted study entitled "Knowledge, attitude, and practice of waste handlers about medical waste management in DebreMarkos town healthcare facilities, northwest Ethiopia" and found (45.4%) were diploma. **from the investigator point of view, the differences may be due to the difference of the study sample and study setting.**

As regarding the years of experience of studied medical waste workers the result of the study reveals that about (45.2%) of the studied sample have ≥ 15 years of experience (**Table 1).** this finding was similar with *P **Akkajit, et al, (2020)*** who conducted study entitled "Assessment of knowledge, attitudes, and practices in respect of medical waste management in clinics" that found (51.2%) of the studied sample had more than ≥15 years of experience.

As regarding the training course of studied medical waste workers, the result of the study reveals that about (4.8%) of the studied sample attending training programs on the safe handling of medical waste(50%) of them attending course about handling and transporting of medical waste and (83.3%) of them attending one course (**Table 1).** this finding was similar with ***B Mugabi et al, (2018)*** who conducted study entitled "Assessing knowledge, attitudes, and practices of healthcare workers regarding medical waste management at a tertiary hospital in Botswana: A cross-sectional quantitative study" that found (7.8%) of the studied sample attending training programs on the safe handling of medical waste.

As regarding the work place of studied medical waste workers, the result of the study reveals that about that, (34%) of them working at surgical clinic. Also (28%) of them working at medicine clinic. Also (22.8%) in dental clinic (**Figure1)**. This finding was agreed with *P **Akkajit, et al, (2020)*** who conducted study entitled "Assessment of knowledge, attitudes, and practices in respect of medical waste management in clinics" that found that, (34.2%) of them working at surgical clinic. Also (22.4%) of them working at medicine clinic.Also (28. %) in dental clinic.

Part (2): Medical history of medical waste workers.

As regarding the chronic disease, the present study shows that, (39.2%) of the studied sample have history of chronic diseases, and (90.7%) of them suffer from a chronic disease after joining work **(Table 2).** The finding was supported by ***Manzoor and Sharma (2019)*** who conducted study entitled Impact of Biomedical Waste on Environmental and Human Health and found that tow third of studded sample have history of chronic diseases and (87,8%) of them suffer from a chronic disease after joining work (from the investigator point of view, this be could be because their a relation between chronic disease and nature of work of medical waste.

As regarding HB Vaccination, the present study shows that, (20.8%) of the studied sample were vaccinated against hepatitis B virus, and (84.6%) of them take three doses **(Table2).** The finding was supported by ***Deress et al, (2019)*** who conducted study entitled"Knowledge, attitude, and practice of waste handlers about medical waste management in DebreMarkos town healthcare facilities, northwest Ethiopia"and found that only 20% of them were vaccinated for HBV.

Part (3): Assessment of data related previous exposure to occupational health hazards related medical waste disposal.

Regarding exposure to occupational health hazards **(Figure 6)** the present study showed that, 83.2% of the studied sample was exposed to biological hazards. Also, 52% of them were exposed to chemical hazards. Moreover, 95.2% of them were exposed to physical hazards. Furthermore, 71.2% of them were exposed to psychological hazards. results were agreed to those of Sarah Mossburg et al. (2019)who conducted study entitled "Occupational Hazards among Healthcare Workers in Africa: A Systematic Review" and found that about more than two thirds of the studied sample exposed to biological hazards and majority of sample are exposed to physical hazard and psychological hazards.

Regarding total exposure to occupational health hazards **(figure7)** the present study showed that96.4% of the studied sample an exposed to at least one type of occupational health hazards. While, 3.6% of them not exposed to any occupational health hazards regarding medical waste disposal.

Also, results were similar to those of Onoja-Alexander, et al, (2020) who conducted study entitled "Occupational Health Hazards Among Medical Waste Handlers in Ahmadu Bello University Teaching Hospital Zaria Northwest Nigeria" and found the majority of waste handling workers exposure to occupational health hazards.

Part (4): Knowledge about medical waste management and occupational health hazards

Regarding the workers knowledge about post exposure actions **(figure 8)** the present studied showed that, (89.6%) of the studied sample have unsatisfactory level of knowledge about post-exposure actions. results were disagreed to those of ***Che Henry Ngwa, et al, (2018)*** who conducted study entitled "Assessment of the knowledge, attitude and practice of health care workers in Fako Division on post exposure prophylaxis to blood borne viruses: a hospital based cross-sectional study and found that,(54%) of them were good knowledge on post exposure prophylaxis actions. The researcher believes, unsatisfactory knowledge of the study sample about post-exposure action could be related to lack of training program about post exposure actions.

Regarding the workers total knowledge about medical waste management and occupational health hazards **(Figure 9)** the present studied showed that, (87%) unsatisfactory total knowledge e about medical waste management and occupational health hazards, While, (12.8%) of them have satisfactory level of total knowledge. These results were agreed with those of Z Letho, (2021) who conducted study entitled "Awareness and practice of medical waste management among healthcare providers in National Referral Hospital" and found that only (83.5%) of them were unsatisfactory total knowledge about medical waste management. While, (16.4%) of them have satisfactory level of total knowledge

Also the present study also agrees with those of Mosleh and Moslehishad, (2018) who conducted study entitled "Occupational Health Hazards among Health Care Workers Center for Research on Occupational Diseases, Tehran University of Medical Sciences, Tehran, Iran," and found that (90.2%) of them were unsatisfactory knowledge about occupational health. While, (9.8%) of them have satisfactory level of total knowledge. from the investigator point of view, the study sample didn't take a training courses or on job training about occupational health hazards related to medical waste management.

Moreover the present studded were disagreed with those of ***RD Govender, (2018)*** who conducted study entitled "Knowledge, attitudes and practices of healthcare workers about healthcare waste management at a district hospital in KwaZulu-Natal" and found that (53.4%and 52.2%) of them were satisfactory knowledge about medical waste management. And occupational hazards from the investigator point of view, the satisfactory knowledge of this study sample may have been related to the many years of experience and attendance of more training courses.

Part (V): Medical waste workers' practice (figure 5)

Regarding for medical waste workers' practice **(Figure 10)** the present study showed that, the majority of studded sample have unsatisfactory level of practice regarding apply universal precautions and hand washing technique, respectively results were agreed to those of ***Deress et al, (2019)*** who conducted study entitled "Knowledge, attitude, and practice of waste handlers about medical waste management in DebreMarkos town healthcare facilities, northwest Ethiopia" and found the majority of studded sample have unsatisfactory level of total practice regarding apply universal precautions and hand washing technique.From the investigator point of view, lake of Regular auditing for medical waste workers to apply universal precautions.

Regarding Total practices the present study showed that, (84%) of the studied sample were unsatisfactory level of total practice regarding medical waste management. **(Figure11).** The results were agreed to those of ***Gihan H, et al, (2018)*** Who conducted study entitled "An intervention significantly improve medical waste handling and management: A consequence of raising knowledge and practical skills of health care worker" and found that, (80%) of them were unsatisfactory level of practice regarding medical waste management.

Regarding workplace environment the temporary storage room **(figure12)** the present study showed that, (82.8%) of the temporary storage room are standard related to standard of environmental structure. While, (17.2%) of them are non-standard. the results were disagreed to those of ***Deress et al, (2019)*** who conducted study entitled "Knowledge, attitude, and practice of waste handlers about medical waste management in DebreMarkos town healthcare facilities, northwest Ethiopia" and found the majority of temporary storage rooms that studded are non-standard. From the investigator point of view, the differences that because the different of study setting**.**

Part (VII): Relationship between the studied variable.

Regarding the relation between demographic characteristics of the studied sample and their total knowledge the finding **(Table 17)** the present study showed that, there were a highly statistically significant relation between the studied sample' knowledge about medical waste management and occupational health hazards and their education level, years of experience and Attendance of previous seminars/ training programs at (P= < 0.01). The results were agreed to those of ***Deress et al, (2019)*** who conducted study entitled "Knowledge, attitude, and practice of waste handlers about medical waste management in DebreMarkos town healthcare facilities, northwest Ethiopia" and found there was a highly statistically significant relation between the studied sample' knowledge and their education level, years of experience and Attendance of previous seminars/ training programs at (P= < 0.01).

Regarding the relation between the studied medical waste workers' knowledge and practice about medical waste management **(Table21)** the present study showed that, there was highly significant positive correlation between total knowledge and total practice regarding medical waste management among studied sample at (P= < 0.01), (r = 0.796). the results were similar to those of ***Govender, (2018)*** who conducted study entitled" Knowledge, attitudes and practices of healthcare workers about healthcare waste management at a district hospital in KwaZulu-Natal" and found There was a significant ($p < 0.05$) relationship between knowledge and practices.

Moreover the present studded were agreed with those of ***Akkajit, et al, (2020)*** who conducted study entitled" Assessment Knowledge, attitudes and practices in respect of Medical Waste Management among Healthcare Workers in Clinics and found There was a highly significant positive correlation between total knowledge and total practice regarding medical waste management among studied sample at (P= < 0.01) and (r = 0.396),

Conclusion

After conducting the present study, it concluded the following:

The present study concluded that the most of study workers who dealing with medical waste are exposed to biological and physical and psychological occupational hazards. The most of the study workers dealing with medical waste had unsatisfactory level of knowledge about occupational hazards regarding medical waste disposal, most of the study workers had unsatisfactory level of knowledge about medical waste management steps (sorting, handling and transportation, storage, treatment and final disposal). The current study clarified that the inadequate practice regarding safe handling procedures among workers dealing with medical waste, the current study showed that most of the workplace environment (temporary storage room of medical waste) not standard according to CDC and Egyptian guideline of infection control. The current study showed that there is highly significant relation between the studied sample' socio-demographic data and their knowledge as well as

that there is highly significant relation between the total knowledge and total practice regarding medical waste management.

Recommendations:

In the light of the present study findings, the following recommendations are suggested:

1. Providing continuous educational programs and on-job training for all workers who dealing with medical waste to improve their performance when dealing with medical waste.
2. Emphasizing the importance of using PPE when dealing with medical west to protect them from exposure to occupational hazards.
3. Regular auditing for medical waste workers and their work practice for their performance in applying standard practices when dealing with medical waste.
4. Encouraging workers who dealing with medical waste to attend training courses regarding the Medical waste management.

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