

# Assessment of Healthcare Waste Management Process in Hemodialysis Units in El Beheira Governorate

**Seham Salem Awad, Nursing specialist**

*Nursing specialist in Al Delingat Hospital In El Beheira Governorate*

**Elham HassanTawfik, Professor**

*Community Health Nursing, Faculty of Nursing, Damanshour University*

**Azza Ibrahim Abd Elkader, Assistant Professor**

*Medical- Surgical Nursing, Faculty of Nursing, Damanshour University*

## Abstract

**Background:** Healthcare Waste Management (HCWM) process enable to managed hemodialysis waste responsibly, without harming the personal, institution and the community. Hemodialysis wastes are risky for all people working in hemodialysis (HD) unit and exposed to waste as well as the community. **Aim of this study:** The study aims to assess HCWM process in Hemodialysis Unit in El Beheira governorate. **Research design:** A descriptive cross sectional research design was used to carry out this study. **Settings:** The study was carried out in five HD units located within five general hospitals allocated to four health directorates in El Beheira governorate. **Subjects:** All nurses and cleaning workers who working in the previously mentioned settings. **Data collection tools:** The following four tools were used in order to collect the required data from the study sample; **Tool I:** Nurse's and Cleaning Worker's Socio-Demographic Characteristics, Health Profile and Occupational Data A Self-administered Structured Questionnaire Sheet for the Nurses and A Structured Interview Schedule for the Cleaning Worker's. **Tool II:** Knowledge of Nurses and Cleaning Workers about HCWM Process in HD Unit A Self-administered Structured Questionnaire Sheet for the Nurses and A Structured Interview Schedule for the Cleaning Worker's. **Tool III:** Practice of Nurses about HCWM Process in HD Unit Structured Observation Checklist. **Tool IV:** Practice of Cleaning Workers about HCWM Process in HD Unit Structured Observation Checklist. **Results:** The highest percent (94%) of the studied nurses and more than three quarters (85.7%) of the studied cleaning workers had good level of knowledge. The highest percent (88.6%, 81%) of the studied nurses and cleaning workers had good level of practice respectively. **Conclusion:** The highest percent of the studied nurses and cleaning workers had good level of knowledge and practice about healthcare waste management process in HD unit in El- Beheira Governorate. **Recommendations:** HD unit should have a close monitoring and supervision to ensure the application of safety regulations in waste handling and develop effective implementations of HCWM plan.

**Keywords:** Healthcare waste management process, nurses, cleaning workers. knowledge, practice, haemodialysis unit.

## Introduction

Renal replacement therapy (RRT) in the form of renal transplantation or renal dialysis becomes an essential aspect for survival for patients with end stage renal disease (ESRD), renal hemodialysis is currently the most commonly adopted method for those patients. (Giorgina B, et all 2020) Hemodialysis process usually carried out two or three time weekly with in Hemodialysis units. Hemodialysis units have unique characteristics other

than other outpatient unites because it has special machine, penetrating equipment used around the day which risk of injury or infection. There are strong evidences supporting that the sharing of machines has a major role in the transmission of viral infection among patients on hemodialysis and suggested possible transmission via accidental contamination of the venous and frequent use of sharps. (Adel A, et all 2015)

A proper healthcare waste management system is very important in healthcare facilities because the overall benefit outweighs the cost which infection and injury decreased. In the healthcare sector, hazardous health care pathogen that has risk for transmission of disease which requires proper management process.( Huda A, et all. 2021. Mohammed S, et all 2017)

Poor medical waste identification and segregation often result in an increase in hazardous waste generation per patient bed per day. This in turn results in a significant increase in the demand for waste management resources. (Novi F, et all 2018. Sartaj M.et all 2015) In developing countries inadequate collection, storage, disposal and treatment of these HCW can lead to serious environmental damage of various types. Some of these health problems include cholera, skin disease, typhoid fever, malaria, and other diseases. So that, the disposal of items used at health institutions must be handled with utmost care so as to ensure that health care workers, patients and members of the community at large are protected from the dangers of secondary transmission of diseases and cause of injuries.( Hasnaa B, et all-2020 )

Nurses should be skilled in caring of ESRD patient, maintain a high standard of clinical practice, have excellent communication skills, and develop their individual leadership and management abilities. Nurses should be involved in multi professional discussions where decisions are made about healthcare waste management. In addition, nurses should have skills to HCW efficiently to avoid its risk and maintain healthy hemodialysis unit.( Aayed A. Bny U 2019)

**Aim of the study:** This study aims to assess Healthcare Waste Management process in Hemodialysis Unit in El Beheira governorate.

**Research Question:** What is Assessment of Healthcare Waste Management process in Hemodialysis Unit in El Beheira governorate?

## Materials and Methods

waste (HHCW) consists of wastes that are potentially contaminated with blood and other body fluids and any material contact with infected patient, which suspected to contain

## Materials

**Research Design:** A descriptive cross sectional research design was used to carry out this study.

**Setting:** The study was carried out in five hemodialysis units located within five general hospitals allocated to four health directorates in El Beheira Governorate (one hospital from each directorate except for one directorate has two government hospitals with HU).

**Subjects:** The nurses and cleaning workers who working in the previously mentioned settings and fulfilling the following inclusion criteria

## **Inclusion Criteria For both nurses and cleaning workers:**

- The nurses full time working in hemodialysis unit and charge for HCWM.
- The cleaning workers full time working in hemodialysis unit
- Have experience not less than 6 months.
- Willing to participate in the study.

**Sample Size:** Nurses and the Cleaning workers who working in the previously mentioned setting and fulfilling the above inclusion criteria were included in the study (n= 316 nurses and n= 42 cleaning workers). The total sample size for nurses and cleaning workers were (n= 358 participants).

**Sampling Technique:** A multiple stage sample technique was used to select the required sample and the following steps were done: El Beheira Governorate is composed of sixteen health directorates. Four out of sixteen health directorates were selected randomly by used the proportional allocation method, (constitute 25%) of the total health directorates. These Four health directorates namely Etai-Elbarod, Hush Essa, Al-Delingat, Kom Hamada. Four health directorates include five general hospitals in El Beheira governorate. All hemodialy-

sis units (5) located within five general hospitals allocated to four health directorates in El Beheira governorate were selected.

**Tools for Data Collection:** The following four tools were used in order to collect the required data from the study sample.

**Tool I: Nurse's and Cleaning Worker's Socio-Demographic Characteristics, Health Profile and Occupational Data:**

This tool was developed by the researcher after reviewing of related literature. Two methods of data collection were used with the study sample to collect the required data as follow: a self-administered structured questionnaire sheet was used for nurses, while a structured interview schedule was used with cleaning workers in order to clarify socio-demographic characteristics, health profile and occupational data. The tool included occupation, age, gender, level of education, marital status, place of residence, name of hemodialysis unit where they work, past medical history, history of infectious disease, years of work experience, attended training course, number of working hours per day, any injury/infection resulting from dealing with medical waste, receiving vaccination of hepatitis B or influenza vaccine.

**Tool II: Knowledge of Nurses and Cleaning Workers about HCWM Process in HD Unit:**

This tool was developed by the researcher after reviewing of related literature. Two methods of data collection were used with the study sample to collect the required data as follow: a self-administered structured questionnaire sheet was used for nurses, while a structured interview schedule was used with cleaning workers in order to assess knowledge about healthcare waste management process in hemodialysis unit. This tool included 13 main sections; background of healthcare waste management, healthcare waste classification and segregation, healthcare waste hazards, healthcare waste collection within healthcare facilities, healthcare waste transportation within healthcare facilities, healthcare waste storage, standard precautions, organization structure for healthcare waste management process in hemodialysis unit, policy and planning for

healthcare waste management process, training courses regarding healthcare waste management process, healthcare waste management poster or signage, monitoring, evaluation and corrective action of healthcare waste management process and Financing of healthcare waste management process.

**The scoring system:** Each subject was asked to respond to each item, three marks were given to correct answer, two marks were given to correct but incomplete answer and one mark was given to incorrect and I don't know answer. The total score was calculated and ranged from 80 to 240. This value was transferred to percent score for 80 statements .

Nurse's and Cleaning Worker's Knowledge were ranked as follows; Good knowledge:  $\geq 75\%$ , Fair knowledge:  $50\% < 75\%$ , Poor knowledge:  $< 50\%$

**Tool III: Practice of Nurses about HCWM Process in HD Unit Structured Observation Checklist:**

This tool was developed by the researcher after reviewing the recent literature in order to describe practice of nurses about healthcare waste management process in hemodialysis unit. This tool included 5 main sections; generation of healthcare waste, classification and segregation of health care waste, color code and labeling of health care waste, waste handling and collection and hazards from chemical and pharmaceutical waste.

**Tool IV: Practice of Cleaning Workers about HCWM Process in HD Unit Structured Observation Checklist:**

This tool was developed by the researcher after reviewing the recent literature in order to describe practice of cleaning workers about healthcare waste management process in hemodialysis unit. This tool included 5 main sections; collection and handling of healthcare waste, transportation of healthcare waste inside health establishment, storage practices for healthcare waste, waste water and personal protective measure.

**The scoring system:** For tool III and IV each nurse and cleaning workers was observed for each items. Three points Likert scale (Rarely =

1; Sometimes = 2; Often = 3) were used. The observation was done three times and the average practice was calculated for the study subjects. The total score for nurses was calculated and ranged between 21 - 63 for 21 statements and this value was converted to a percentage score. The total score for cleaning workers was calculated and ranged between 32 - 96 for 32 statements and this value was converted to a percentage score

Nurse's and cleaning worker's practice were ranked as follows; Good practice:  $\geq 75\%$ , Fair practice :  $50\% < 75\%$ , Poor practice:  $< 50\%$

## Methods

**Administrative Process:** Official letter from Faculty of Nursing, Damanhur University was directed to the representative of the Directorate of Health Affairs in El-Beheira Governorate to inform them about the study aim and obtain permission to conduct the study. Official letter from the representative of the Directorate of Health Affairs in El Beheira Governorate was directed to the five general hospital directors to inform them about the study aim and obtain permission to conduct the study.

**Development of Study Tools:** The study tool I, tool II, tool III and tool IV was developed by researcher after review of the related literature and they was translated into Arabic version. Content validity of the study tool I, tool II, tool III and tool IV were tested by a jury consists of a group of (5) experts in the field of community health nursing and medical-surgical nursing, their opinions and suggestion were taken into consideration, the necessary modifications were done for example the long statements modified to be short statements (are the contaminated wastes with blood and other bod fluids considered hazardous waste, modified to bodily waste considered hazardous waste).. The reliability of the tool II, tool III and tool IV were tested using appropriate test (comps alpha test ) and the result for tool II 0.907, tool III 0.739 and tool IV 0,918, the tools were reliable.

**Pilot study:** The pilot study was applied on 10% of the nurses (32) and 10% of the cleaning workers (4) were chosen randomly from

other hospitals located within other health directorates in El Beheira governorate (Kafr-El-Dawar health directorates, Abo Homos health directorates) and then they were excluded from the study sample to assure the clarity and applicability of the study tools and to estimate time needed for data collection.

**Data Collection:** Self-administered questionnaire sheet were carried out for nurses individually to answer tool I, tool II after a brief explanation of the aim of the study to gain their cooperation, each questionnaire sheet for nurses took approximately 30-40 minutes for tool I, tool II. The interviews were carried out for cleaning workers individually and asked to answer tool I, tool II after a brief explanation of the aim of the study to gain their cooperation, each interview for cleaning workers took approximately 30-40 minutes using tool I, tool II. The nurse's participants were observed using tool III and cleaning workers were observed using tool IV, each observation took approximately 4 hours using tool III, tool IV. Data were collected over a period of 3 months (from February 2022 to April 2022).

**Ethical consideration:** Participation was on voluntary base. Informed written consent was obtained from every personal. participated in the study after explanation of the aim of the study and participation was assured that collected data will be used only for the study purpose. Privacy and confidentiality was assured during data collection. Anonymity of the study nursing was maintained and there right to withdrawal from the study at any time without any drawbacks was confirmed.

**Statistical analysis of the data:** Data were coded and transferred into specially designed formats to be suitable for computer feeding. Following data entry, checking and verifying process were carried out to avoid any errors during data entry. Frequency analysis, cross tabulation and manual revision were all used to detect any errors. Data was analyzed using personal computer (PC) with statistical package for social science (SPSS) version 20. Variables were analyzed using the descriptive statistics which included: numbers, percentages, frequencies, range (minimum and maximum),

arithmetic mean and standard deviation. (SD). The level of significance selected for this study was  $P \leq 0.05$ . Chi-square test: For categorical variables, to compare between different groups. Fisher's Exact or Monte Carlo correction: Correction for chi-square when more than 20% of the cells have expected count less than 5.

**Results**

**Table (1): Illustrates the distribution of the studied nurses and cleaning workers according to socio-demographic characteristics.** The total number included in the study was 358 (316 nurse and 42 cleaning worker). The studied *nurses* age from 24 to 49 years with the mean  $31.3 \pm 4.9$  the nearly half (49.1%) of nurses age from 30 to less than 40 years, while a minority (5.7%) of them age from 40 to less than 50 years. On the other hand the *cleaning workers* age ranged from 32 to 56 years with a mean  $44.4 \pm 5.9$  more than half (54.8%) of cleaning workers aged from 40 to less than 50 years, while more than one fifth (21.4%) of them age more than 50 years.

Regarding **gender**, it was obviously the highest percent of the studied *nurses* and *cleaning workers* were females (92.1%, 71.4%) respectively.

Regarding **level of education**, more than half (58.2%) of studied *nurses* had technical nursing institute, will slightly more than one fifth (20.3%) of them had secondary nursing education. on the other hand more than three quarters (81 %) of *cleaning workers* had Illiterate / Read and written, while nearly one fifth (19%) of them had Basic education.

Regarding **marital status**, more than three quarters (81.3%) of studied *nurses* were married, while less than tenth (6%) of them were widow/divorced. Whereas nearly three quarters (73.8%) of *cleaning workers* were married, while only (2.4%) of them were single.

Regarding **residence**, the highest percent of the studied *nurses* and *cleaning workers* were living in rural area (68.0%, 83.3%) respectively.

**Figure (1): Illustrates the distribution of the studied nurses and cleaning work-**

**ers according to overall score of knowledge about HCWM process in HD unit.** Regarding *to overall score of knowledge about HCWM process in HD unit* It can be noticed from this figure the highest percent (94%) of the studied *nurses* had good knowledge, while less than one tenth (6%) of them had fair knowledge. Whereas more than three quarters (85.7%) of the studied *cleaning workers* had good knowledge, while more than one tenth (14.3%) of them had fair knowledge.

**Figure (2): Illustrates the distribution of the studied nurse's according to overall score of practice about HCWM process in HD unit.** It can be noticed from this figure the highest percent (89.8%) of the studied *nurses* had good practice, while more than one tenth (10.2%) of them had fair practice.

**Figure (3): Illustrates the distribution of the studied cleaning workers according to overall score of practice about HCWM process in HD unit.** This figure shows that, the highest percent (81%) of the studied *cleaning workers* had good practice, while less than one fifth (16.7%) of them had fair practice.

**Table (2): Illustrates the correlation between overall knowledge score of nurses and cleaning workers about HCWM process in HD unit and their overall practice score.** As shows in this table, the studied nurses and the studied cleaning workers had statistically significant correlation between overall knowledge score and overall practice score ( $p < 0.001$ ), ( $p = 0.004$ ) respectively

**Table (1): Distribution of the Studied Nurses and Cleaning Workers according to Socio-demographic Characteristics**

Socio-demographic Characteristics	Nurses (n = 316)		Cleaning Workers (n = 42)	
	No.	%	No.	%
<b>Age (years)</b>				
<30	143	45.2	0	0.0
30 – < 40	155	49.1	10	23.8
40 – <50	18	5.7	23	54.8
≥50	0	0.0	9	21.4
Min – Max.	24.0 – 49.0		32.0 – 56.0	
Mean ± SD.	31.3 ± 4.9		44.4 ± 5.9	
<b>Gender</b>				
Male	25	7.9	12	28.6
Female	291	92.1	30	71.4
<b>Level of Education</b>				
Illiterate / Read and written	0	0.0	34	81.0
Basic education *	0	0.0	8	19.0
Secondary nursing education	64	20.3	0	0.0
Technical nursing institute	184	58.2	0	0.0
University or higher	68	21.5	0	0.0
<b>Marital Status</b>				
Single	40	12.7	1	2.4
Married	257	81.3	31	73.8
Widow / Divorced	19	6	10	23.8
<b>Residence</b>				
Urban	101	32.0	7	16.7
Rural	215	68.0	35	83.3

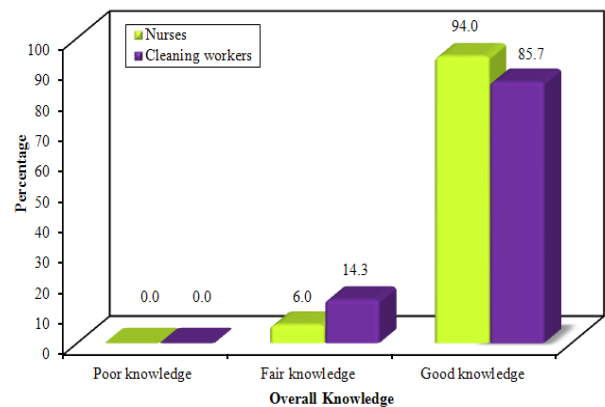


Figure (1): Distribution of the studied Nurse's and Cleaning Worker's according to Overall Score of knowledge about HCWM process in hemodialysis unit.

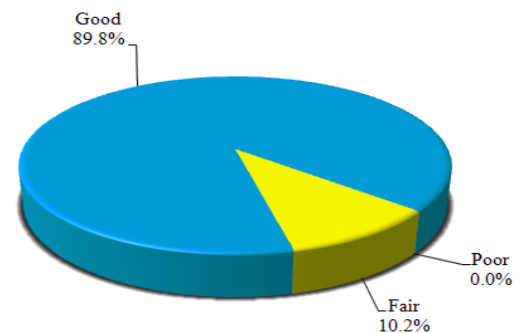


Figure (2): Distribution of the Studied Nurse's according to Overall Score of Practice about HCWM Process in HD unit.

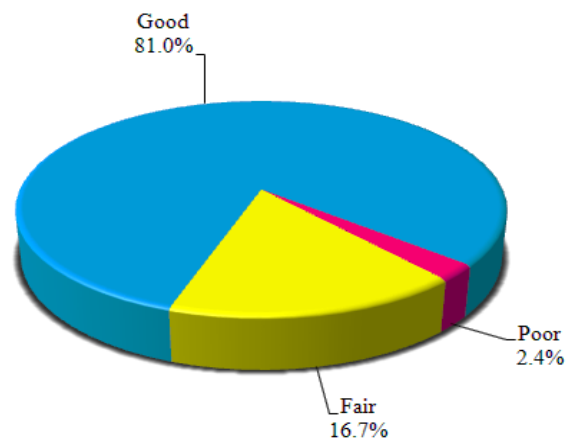


Figure (3): Distribution of the Studied Cleaning Workers according to Overall Score of Practice about HCWM Process in HD Unit.

**Table (2): Correlation between Overall Knowledge Score of Nurses and Cleaning Workers about HCWM Process in HD Unit and their Overall Practice Score.**

	Overall Knowledge Score of Nurses (n = 316)		Overall Knowledge Score of Cleaning workers (n = 42)	
	R	P	R	P
<b>Overall Practice Score</b>	0.252*	<0.001*	0.435*	0.004*

r: Pearson coefficient

\*: Statistically significant at  $p \leq 0.05$

## DISCUSSION

Healthcare waste in hemodialysis (HD) unit is a special type of waste produced in relation to different healthcare activity carrying a high potential of infection and injury. These wastes should always be assumed to potentially contain a variety of pathogenic microorganisms. This is because the presence or absence of pathogens cannot be determined at the time a waste item is produced and discarded into a container. The health care team members are considered the first line of defense to face the risks of HCW. If these risks passed the first line of defense the results become disastrous there for healthcare facilities administration will not be able to ace the hazard of HealthCare waste (HCW) successfully without the cooperation of the health care team members. (Sobh DR 2018)

Adequate knowledge of those who are potential handlers of healthcare waste management (HWM) is important to understand its health hazards, proper technique and methods of handling the waste, and practice of safety measures which also be a base for its safe disposal

Adequate knowledge of *nurses and cleaning workers* about the healthcare waste

management (HCWM) process is important to understand its health hazards, proper technique and methods of handling the waste and practice of safety measures which also are a base for its safe disposal. (Khedre HB 2020) In the current study the majority of the studied *nurses* had good level of knowledge about healthcare waste management process in hemodialysis unit. These findings were consistent with the results of the study conducted by **Ali O (2022)** in Sudan, which reported that 78.8% of the studied nurses had good level of knowledge regarding bio-medical waste management process in hemodialysis unit in El-Mak Nimer University Hospital . On the other hand, these findings of the present study contradict with the study conducted by **Kumar D (2019)** in India, which reported that 75% of the nurses had inadequate level of knowledge about biomedical waste management process. This difference could be explained by there were continuously training program every 6 months in Egyptian hospitals from infection control committee about HCWM process in hemodialysis unit for all nurses. In addition, availability of guideline and the procedure regarding HCWM process in hemodialysis unit.

Regarding to studies *cleaning workers*, more than three quarters of them had good level of knowledge about healthcare waste management process in hemodialysis unit. These current results were in the line with result of the study conducted by **Elsayed A et al (2020)** in Egypt and **Paniyadi N et al (2019)** in India , they reported that 85.3% and 80% of cleaning workers had good level of knowledge about bio-medical waste management process respectively. While these findings of the present study contradict with the study conducted by **Gamal N et al (2018)** In Egypt, which reported that 85% of the studied housekeeping had unsatisfactory level of knowledge about healthcare waste management process. This variation can be justified by in the current study by three points: firstly, there were Periodic training program every 3 months about HCWM process in hemodialysis unit for the studied cleaning workers. Secondly, many posters about the healthcare waste manage-

ment process allocated in HD unit. Finally, more than half of cleaning workers had work experiences from 10 to 20 years in hemodialysis units.

Nurses are expected to dispose of healthcare waste in hemodialysis unit according to local policy to prevent occupational exposures. The present study revealed that the highest percent of the studied *nurses* had good level of practice about healthcare waste management process in hemodialysis unit. These results were agreed with the study conducted by **Al Qahtani A et al (2015)** in Saudi Arabia. They reported that the majority (89.9%) of nurses had adequate practice about the healthcare waste management process in hemodialysis unit. In other hand, these findings were contradicted with the results of the study conducted by **Bedier N et al (2022)** in Egypt. They observed that all nurses working in hemodialysis unit had inadequate performance (<60%) related to handling the equipment, supplies and dispose of medical waste in HD unit (removing mask, gown, gloves, handling sharps). This disparity may be due to the highest percent of the studied nurses had good level of performance toward HCWM process. In addition, there was evaluate periodically every month and the nurses who adhere to proper HCWM are included in monthly bonus.

Regarding the studied *cleaning workers* the highest percent of them had good level of practice about healthcare waste management process in hemodialysis unit. These findings were consistent with the results of the study conducted by **Ali O (2022)** in Sudan. This reported that 72.3% of the studied cleaning workers had good level of practices regarding bio-medical waste management process in hemodialysis unit in El-Mak Nimer University Hospital. On other hands, these findings of the present study contradict with the study conducted by **Gamal N et al (2018)** In Egypt, reported that 87.4% of the studied housekeeping had unsatisfactory level (<60%) of practice about healthcare waste management process. This dissimilarity could be explained by there were close observation from infection

control committee in hemodialysis unit in El Beheira Governorate about the process of healthcare waste management. In addition, the Egyptian Ministry of Health place the process of HCWM among its priorities, as it has employed a special committee to supervise the collection and dealing of HCW with in each hospital and provide it with necessary supplies and equipment

Regarding to **the relation between socio demographic characteristics of the studied nurses, cleaning workers and their level of knowledge**, the present study revealed that there were statistically significant relation between nurse's level of knowledge about HCWM process in HD unit in El-beheira governorate with their level of education, age and low years of experience in HD unit. These is the same view of **Sobh D (2018)** in Egypt, who approved that there were statistically significant relation between nurse's level of knowledge about HCWM with their age and nurse's different level of education.

While these findings of the current study are disagree with the study conducted by **El-Naggar S et al (2017)** In Egypt, which shows that there was no statistically significant relation between nurse's knowledge about medical waste disposal and their age and years of experience. This variation can be justified by two points: firstly; every hemodialysis unit in El-beheira governorate has a highly qualified nurse responsible for assess nurse's knowledge and conduct section about the healthcare waste management process (segregation, color code, collection, transportation, storage, hazards from HCW). Moreover, the results of the current study revealed that the highest percent of the studied nurses had attended training course from less than one year. Secondly; less than two thirds of the studied nurses aged over 30 years and less than two thirds of them were years of experience less than 10 years in hemodialysis unit had good level of knowledge. In addition, more than three quarters of the studied nurses who technical nursing institute and university had good level of knowledge.



Regarding to the studied *cleaning workers*, the present study showed that there was a statistically significant relation between the cleaning worker's level of knowledge about HCWM process in HD unit in El-beheira governorate and their age. These results of the current study contradict with the study conducted by **Paniyadi N et al (2019)** in India and **Gamal N et al (2018)** in Egypt, they found that there was no statistically significant relation between knowledge of housekeeper's regarding safe healthcare waste disposal with all stage of their age. This difference may be clarified by more than three quarters of the studied cleaning workers were aged over 40 years old had good level of knowledge. Also, increasing the flow rate in HD unit in El-beheira governorate is produces a large amount of healthcare waste; which leads to the infection control committee increase the

focus on the training courses for cleaning workers about the process of healthcare waste management.

Interestingly, the relation between socio demographic characteristics of the studied *nurses* and their level of practice, the current study conveyed that there was statistically significant relation between nurse's level of practice about HCWM process and their age, low years of experience in HD unit in El-beheira governorate. These results agreed with the results of the study conducted by **Sobh D (2018)** in Egypt which reveals the relation between staff nurse's level of practice about HCWM process with their personal and job characteristics, the high-est percentage of nurses who had adequate practice had age more than 30 years.

This results in the current study may be clarified by in the fact shortage in staff nursing in Egyptian hospitals in El-beheira governorate which increase the over load on the staff nursing, caring for larger number of patients and their working hours more than expected. Where in the current study revealed that, less than two thirds of the studied nurses

were years of experience less than 10 years in hemodialysis units had good level of practice.

Regarding to the *cleaning workers*, the present study revealed that there was a statistically significant relation between the cleaning worker's level of practice about HCWM process and their age above 40 years, years of experience more than 10 years in HD unit in El-beheira governorate. These results contradict with the study conducted by **Gamal N et al (2018)** in Egypt. They indicated that there was no statistically significant relation between the all stage of age and all years of experience of house-keepers with their practice about safe healthcare waste disposal. This variation may be explained by there is a limited number of cleaningworkers in the hemodialysis units in governmental hospitals of El-beheira governorate; these increase the exposure of cleaning worker to dealing with HCW and lead to their become more expert to the implementation of HCWM process. In addition, presences of good supervision from infection control team for the cleaning workers about monitoring of HCWM process implementation.

Finally the present study revealed that there was statistically significant correlation between the studied *nurse's* level of knowledge about HCWM process and their level of practice in HD unit in El- Beheira Governorate. This finding reflects that the good nurse's practices about HCWM process based on their good level of knowledge. These findings were consistent with the study done by **Elsayed A et al (2020)** In Egypt, who found that there was a statistically significant correlation between nurse's level of knowledge about hospital waste management and their level of performance. On other hands, these results are contradicted with the result of the study conducted by **El-Naggar S et al (2017)** in Egypt, they reported that there were no significant association between percentage of nurse's knowledge and their practice among HCWM.

Regarding the *cleaning workers* the current study clear that there was a statistically significant correlation between the cleaning worker's level of knowledge about healthcare waste management process and their level of practice in HD unit in El-Beheira Governorate. These findings were consistent with the result of the study done by **Elsayed A et al (2020)**, in Egypt which shows that there was a statistically significant correlation between knowledge of cleaning workers about hospital waste management and their performance. While these findings of the present study contradicted with the study conducted by **El-Naggar S et al (2017)** in Egypt, who found that there was no statistically significant correlation between knowledge of cleaning workers about HCWM process and their practice. This variation may be explained by in the present study more than three quarters of the studied cleaning workers had good level of knowledge and practice about the healthcare waste management process.

#### **CONCLUSION AND RECOMMENDATIONS**

**Based upon the findings of the current study it could be concluded that;** the highest percent of the studied *nurses* and *cleaning workers* had good level of knowledge and practice about healthcare waste management process in HD unit in El- Beheira Governorate. Moreover, there was a statistically significant correlation between knowledge, practice of the studied *nurses* and *cleaning workers*.

**Based on the current study findings the following recommendations are suggested:**  
**Ministry of Health and Population**

Monitoring and supervision for plans, policies and guidelines in regular base to ensure proper application of healthcare waste management process in hemodialysis unit. Allocate sufficient financial and manpower resources for implementation of HCWM plan.

#### **Hemodialysis Unit**

Motivating the staff nurses through the application of specific rewards schemes such as honoring nurses who are devoted for HCWM practices.

**Infection Control Committee** Provide up-dated written policies of healthcare waste management at hemodialysis unit and review it continuously. Assess and follow up of nurses, cleaning workers knowledge and practices about HCWM process in hemodialysis unit. Implementing educational programs for nurses and cleaning workers in regular base to improve their knowledge and practice about HCWM process. Training of newly recruitment (nurses and cleaning workers) before taking up work and retraining them after six month. Educational posters about the healthcare waste management process should be displayed in hemodialysis unit to increase awareness of nurses and the cleaning workers. Monitoring and evaluate of nurses and cleaning workers in hemodialysis unit in regular base to ensure safe practices about HCWM process.

#### **Further Research**

Further studies need to be conduct to:

The role of policy makers, stakeholders and government leaders in HCWM process. Impact of the shortage of nurses on HCWM practices. The wrong use of color cod and its impact on health hazards related to HCWM.

#### **Referance**

- Aayed A. Bny U, 2019. Knowledge, attitudes and practices for dialysis nursing staff regarding personal protection means from hospital acquired in Mousl hospital. Mosul Journal of Nursing, Vol.7, No.2,
- Adel S, and Metrek A, 2015. Knowledge, Attitudes and Practice of Nurses in Renal Dialysis Units Regarding Infection Control in Abha City – Saudi Arabia. The Egyptian Journal of Hospital Medicine Vol. 66, Page 103-114. DOI : 10.12816/0034640
- Adel Saeed Al Qahtani<sup>1</sup> and Metrek Ali Almetrek. 2015. Knowledge, Attitudes and Practice of Nurses in Renal Dialysis

Units Regarding Infection Control in Abha City – Saudi Arabia, The Egyptian Journal of Hospital Medicine (Jan. 2017) Vol. 66, Page 103-114

- Alaa N. (May 2018): Assessment of nurses knowledge about healthcare waste management in duhok city. Polytechnic Journal: Vol.8 No.2 Pp:35-43
- Amna A. Manal M. and Gehan M. 2020. Assessing Knowledge and Performance of Healthcare Providers Regarding Hospital Waste Management in Menoufia Governorate Hospitals, Menoufia Nursing Journal Vol. 5, No. 1, May. <https://menj.journals.ekb> . Print ISSN: 2735-3974 Online ISSN: 2735-3982
- Dalia R. Sameh F, Hind M. 2018. Knowledge and practice of staff nurses related to healthcare waste management. Port said scientific journal of nursing. Vol 5, No 2,
- Dhasarathi K 2019. A Study to Access the Knowledge Level on Bio-Medical Waste Management among the Nurses in Tamilnadu. Research Article. Acta scientific medical sciences. Volume 3 Issue 1
- Elnaggar S, Abass R, El-Gohry S and Abd-Elaazem W 2017. Medical waste management educationaland training intervention program in zagazig university hospitals. Egyption journal of occupitioal medicine.; 41 (3) ;459-474.
- Giorgina B, Adamasco C, Filippo A. (2020). Green nephrology and eco-dialysis: a position statement by the Italian Society of Nephrology. Journal of Nephrology 33:681–698 <https://doi.org/10.1007/s40620-020-00734-z>
- Hasnaa B, Ali H, Walid Q. (2020). assessment of healthcare wastes management at egyptian hospital: case study at qotour general hospital. Journal of Environmental Studies and Researches 10 (2):348-361 <http://epu.edu.krd/ojs/index.php/Journal> <https://doi.org/10.25156/ptj.2018.8.2.218>
- Huda Al, Kingsley, Catherine , etc. 2021. Quantitative Assessment of Medical Waste Management in Hamad Medical Corporation—Qatar. Occupational Diseases and Environmental Medicine, 112-126 , ISSN Online: 2333-357X, ISSN Print: 2333-3561, <https://www.scirp.org/journal/odem>
- Mohammed S, Othman N, Hussein A. and Rashid K. (2017). Knowledge, Attitude and Practice of Health Care Workers in Sulaimani Health Facilities in Relation to Medical Waste Management. Kurdistan Journal of Applied Research (KJAR), 2, 143-150. <https://doi.org/10.24017/science.2017.2.21>
- Nabila A, Hashem M, Sanaa E, Elazim S, Hayat A. 2015. Assessment of nurses practices about hemodialysis in port-said city. Port said sintific journal of nursing. Vol 2, No 1
- Nagwa G, Hoda F & Neama M 2018. In-service training Program for Housekeepers Regarding Safe Health Care Waste Management at Main Assiut University Hospital. Assiut Scientific Nursing Journal Vol , (6) No , (14)
- Nanda K. Asha P, Alice M, Edavathra J, Kumari R, Poonam N, Ritu K, 2019. Knowledge and practice among house-keeping staff on methods of bio-medical waste (BMW) management. Original article. Manipal Journal of Nursing and Health Sciences | January | Volume 5 | Issue 1
- Novi, F., Enri, D., Indah, R., Venny, U. and Yati, S. (2018) Generation and Proportion Assessment of Hospitals Infectious Waste in Bandung Region Indonesia. E3S Web of Conferences , 73, 07018 . <https://doi.org/10.1051/e3sconf/20187307018>

- Ommama A 2021. Assessment of Knowledge, Attitude and Practice of Bio-medical Waste Management among Health Care Personnel at El-Mak Nimer University Hospital. Research Article. Journal of Health Statistics Reports. ISSN: 2755-9866
- Sartaj, M. and Arabgol, R. (2015) Assessment of Healthcare Waste Management Practices and Associated Problems in Isfahan Province (Iran). Journal of Material Cycles and Waste Management , 17, 99-106. <https://doi.org/10.1007/s10163-014-0230-5>
- World Health Organization: Health Care Waste Management Manual. Fourth Edition 2020
- Khedre HB, Saleh AH and Abdo WSQ. Assessment of healthcare wastes management at Egyptian hospital: case study at Qotour general hospital. Journal of Environmental Studies and Researches. 2020; 10(2):348-361. doi:10.21608/jesr.2020.136574.
- Sobh DR. Knowledge and practice of staff nurses related to health care waste management. Port Said Scientific Journal of Nursing. 2018; 5(2):20-43. doi:10.21608/PSSJN.2018.33322. available at 2020.