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Nurses' Aseptic Technique Knowledge, Practice, and Compliance for Patients Receiving Hemodialysis

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Abstract:

Background: The quality of hemodialysis patient nursing care should be consistent with national standards of care, which are used as a starting point for better, more exceptional practice, and adherence ensures efficacy. **Aim:** To assess nurses' knowledge, practice, and compliance with aseptic technique for hemodialysis patients. **Design**: Descriptive research design was used. **Setting**: The research was carried out in a hemodialysis unit at Assiut University Hospital in Egypt. A convenience sample of 40 nurses was taken. **Tools:** (1) Nurses' questionnaire, (2) Observation Checklist Sheet, (3) Assessment of Nurses' Aseptic Technique Compliance Sheet. **Results**: The majority of them had a diploma education with ≥10 years of experience and 75% attained infection control training programs. 55% of the studied nurses had a poor knowledge level about infection control regarding hemodialysis and not compliance to standard precaution for patients undergoing hemodialysis. **Conclusion**: Majority of the nurses had a poor level of knowledge regarding infection control in hemodialysis unit, aseptic techniques were noncompliance to the standard of nursing care for hemodialysis patient. **Recommendations**: Continuous education and refreshment for nurses' knowledge and practice regarding infection control education in hemodialysis units.

Keywords: Aseptic technique, Compliance, Hemodialysis, Knowledge & Practice.

Introduction

Infection is the most prevalent reason for hemodialysis patients to be admitted to the hospital and the second leading cause of death. Dialysis patients have a higher risk of infection than non-dialysis patients (**Yassin et al., 2018**)

The most prevalent problem affecting hospitalised patients is healthcare-associated infection, which causes significant morbidity and mortality **(Clare & Rowley, 2018).**

Blood Stream Infections (BSIs) are widespread in hemodialysis facilities, which are considered high-risk environments. Hepatitis C virus is one of the BSIs found in hemodialysis units across the Middle East, particularly in Egypt (Ahmed et al., 2010) and Vietnam **(Nguyen et al., 2019**). Infection in the bloodstream can arise as a result of improper procedures such as syringe reuse between patients or contamination of intravenous fluids (IV) **(Lindberg et al., 2013).**

The majority of hemodialysis operations, including as hemodialysis machine setup, patient connection or disconnection from the machine, patient cannulation, accessing vascular catheters or permanent catheters, needle removal, and intravenous medication administration, are considered invasive **(Adhikari & Aryan, 2019).**

Infections in dialysis units can be reduced by strictly adhering to infection control methods such as aseptic technique, disinfection procedures, equipment maintenance, and thorough monitoring of all procedures that may result in microbial contamination. All new employees, as well as health care personnel, should be trained and educated on infection control procedures on a regular basis **(Yassin et al., 2018 ,Vijayan & Boyce, 2018)**

One of the most common and significant clinical competences in healthcare is aseptic technique. Aseptic method is a collection of infection-prevention procedures aimed at protecting patients against infections caused by the spread of harmful microorganisms. It mandates that healthcare providers use a single aseptic approach that can be demonstrated through training and audit. **(Clare & Rowley, 2018)**

Nurses are the first line of defense in preventing infection transmission from one source to another by using everyday infection control measures. They have a variety of options for reducing the risk of infection by adhering to and performing conventional procedures. Due to the frequent use of catheters and needles to obtain the blood, hemodialysis patients are

at a high risk of infection of bloodstream and their weakened immune systems **(Adhikari & Aryan, 2019)**

The majority of infections in healthcare are spread by health care professionals and patients through various activities or clinical procedures. On the other hand, direct contact with patients by healthcare providers, the performance of clinical and nonclinical procedures, the use of equipment in healthcare settings, and the recapping of needles and other sharp devices exposes concerned individuals.to blood born infections such as hepatitis B, C and HIV viruses. In order to reduce the prevalence of health-care infections in all settings, national and international health organizations must promote infection control guidelines. (**Adhikari & Aryan, 201**9**) & (Karkar,. 2018**).

Because health-care-related infections have a significant influence on population morbidity and mortality, nurses can play a vital role in preventing infection transmission in health-care settings, which is both time and cost effective. Using their knowledge, abilities, and judgement, all nurses in all professional related tasks can build a management and supervision of infection control and prevention **(Adhikari & Aryan, 2019; Stavropoulou et al., 2017).**

The paucity of nurses and the absence of equipment and supplies are two major variables that have a detrimental impact on compliance with standard precautions and aseptic technique. Continuous teaching and supervision can help to increase compliance and by placing a sufficient number of sinks, soap dispensers, paper towels, hand lotions (e.g., one for every two to four dialysis stations) and alcohol-based hand rubs (ABHRs) at each patient station in convenient places. ABHR is recommended for use in all clinical circumstances because to its proven superior efficacy in decontamination, better skin tolerability, and convenience of application if hands are not visibly soiled **(Shaban, 2019).**

Significant of study

Hemodialysis is a complex procedure and has numerous attendant risks and complications associated infection. Infection complications increase morbidity, inpatient stay, hospital cost and mortality of hemodialysis patients, which makes the health care providers do great efforts to decrease the incidence and risk factors of these complications. Nurses are the largest group of workers; in addition, they have close and continuous contact with patient. Therefore, they are uniquely placed to incorporate preventive and promote strategies in the day-to-day care they provide. According to the researcher's clinical experience it has been observed that nurses mainly not executing sterilization techniques appropriately to the patients. Hemodialysis patient need to special nursing care to decrease infection and prevent complication. Aseptic technique practices in hemodialysis unit remain the most important measure to prevent and maintain a healthy environment and to prevent and avoid dissemination of infection.

Aim of the study

The present study was carrier out to:

To assess nurses' knowledge, practice, and compliance with aseptic technique for hemodialysis patients.

Research Questions:-

1. What are the level of nurses' knowledge and practice regarding aseptic technique at hemodialysis?
2. Doses the nurses compliance to aseptic technique at hemodialysis?

Operational definition:

Compliance:

This term means conformity to rule such as a specification, policy, stander or law. It is a state of being in accordance with established guidelines, specifications or legislations.

Subjects and Methods

Research design:

Descriptive design was utilized to conduct this study.

Sample:

Convenience of forty nurses working in hemodialysis unit who were willing to participate in this study.

Setting:

The study was conducted in Hemodialysis unit at Assiut University Hospital.

Tools:

Three tools were utilized to collect data for this study:

Tool (1): Nurses questionnaire:

This tool was designed and developed by the researcher, after reviewing extensive and relevant literature review to assess nurses' knowledge about aseptic technique practices in hemodialysis unit.

It included:

- **Part I: Demographic data about the nurses** such as (age, gender, qualifications, years of experience, training courses...etc.)
- **Part (2): Nurses' knowledge:** This was developed by researcher after reviewing extensive literature **(Clare & Rowley, 2018), (Adhikari & Aryan, 2019) & (Shaban, 2019).**

This part was developed in Arabic to assess nurses knowledge about aseptic technique practices inside hemodialysis unit.

It was consisted of 18 multiple choice questions about knowledge regarding care, maintenance, complications of cardiovascular system, risk factors and prevention of catheter Relate

Each question has only one correct answer that was scored '1' while the wrong answer was scored '0'.

Summation and percentage of the score of the correct answers will calculated in each knowledge item for all participants.

The total scores ranged from (0 to18) degrees.

Nurses' knowledge total scores classified as:

- Good knowledge ≥ 75%
- Fair Knowledge 50- 75%
- Poor knowledge <50%.

Tool (2): Observation checklist:

This tool used to assess nurses practice regarding aseptic technique in hemodialysis unit**:**

Observation checklist for aseptic technique practices:

- It included aseptic technique practices of the nursing staff regarding invasive and non-invasive procedures, which included steps that should be followed in sequence.
- General precaution: (total aseptic technique practices, hand hygiene, gloves, gown and mask)
- Specific precaution: (total specific precaution for dialysis hemodialysis catheter care, connection, disconnection, arteriovenous fistula/graft cannulation, invasive and non-invasive procedures, cannulation of arteriovenous fistula (care, accessing a vascular catheter, initiation of hemodialysis care and termination of hemodialysis care), administering iv push medications through an intermittent device (IV lock), central venous access device (CVAD), dealing with sharp objects and blood, body secretions& fluids, safe injection practice, dialysis station routine disinfection).

Scoring System: It used a 3 point likert scale.

- Not done =1
- Done incomplete correct =2
- Done correct =3

Tool (3): Assessment of nurses compliance with aseptic technique sheet:

This tool used to assess nurses compliance regarding aseptic technique in hemodialysis unit.

The researcher observe the studied nurses during their work with the hemodialysis patients before, during and after dialysis session compliance each step or not. Observe their compliance or non compliance to each step.

Scoring System:

- Compliance =1
- Non-compliance =0

Tools validity and reliability

- Tools' validity was tested by (5) experts (specialists in the field of medical - surgical nursing); their opinions were formulated as regard to the tool format layout, consistency, knowledge accuracy, relevance and competence. Tools reliability refers to the degree of consistency with which the instrument (the questionnaire) measures the thing it is supposed to be measuring (nurses' knowledge and practice). Reliability of tool was confirmed by Alpha Cronbach test (0.95, 0.89 and 0.87).

A pilot study

A pilot study was conducted on 10% of the sample (4 nurses) to evaluate the applicability and clarity of the tool was done. Based on the results of the pilot study, needed refinements were made. Nurses selected for the pilot study were included in the main study. This pilot study was conducted two months before collection of data.

Ethical approval:

Permission to carryout the study was obtained from the ethical committee of the Faculty of Nursing. Verbal consent was obtained from each nurse prior to his/her contribution in the present study, after explaining the nature and purposes of the study. Confidentiality and anonymity assured. The researcher emphasized that the participation was voluntary and the nurses had the right to refuse to participate in the study and can withdraw at any time.

Methods

The study was carried out in the following steps:

- An official approval letter was obtained from the Dean of the Faculty of Nursing.
- An official approval for data collection was obtained from administrators of the Assiut University Hospital, Dialysis Unit.
- The researcher reviewed the relevant related literature of national & international, textbooks, articles, and scientific magazines.
- At initial interview the researcher introduced herself to initiate a line of communication.
- Nurses' agreement for voluntary participation was obtained and purpose and nature of the study was explained.
- The researcher obtain the baseline data from the nurses using Tool 1 part (I)
- Assessment of nurses' knowledge about aseptic technique practices inside hemodialysis unit using Tool 1-part (II).
- The nurses filled this tool individually in the nursing room after their shift was finished.
- Assessment of the nurses' practice regarding aseptic technique in hemodialysis unit using observation checklist and nurses compliance (Tool 2 and 3) which filled by the researcher.
- The study was carried out at morning and afternoon shift.
- Data were collected during the period from 1/1 /2020 to 1/6/2020.

Statistical analysis:
The statistical package for (SPSS) version (23) was used to analyze data. Descriptive statistics was used for the quantitative data in all questions and the demographic data. Descriptive statistics included: means, standard division, frequencies, percentages.

Results:

Table (1): Percentage distribution for demographic characteristic among nurses participant (n=40)

Variables	No. (40)	%
Age: (years)		
20 - < 30	21	52.5
30 - < 40	11	27.5
≥ 40	8	20.0
Sex:		
Male	24	60.0
Female	16	40.0
Level of education:		
University	5	12.5
Diploma	35	87.5
Years of experience:		
< 2	7	17.5
2 - < 5	8	20.0
5 - < 10	5	12.5
10 and more	20	50.0
Attained training about infection control:		
Yes	30	75.0
No	10	25.0

Table (2): Distribution of the total nurses' knowledge about infection and infection control regarding hemodialysis(n=40)

Variables	Good knowledge ≥70		Fair knowledge 50-70		Poor knowledge <50	
	No.	%	No.	%	No.	%
Total knowledge total score (18 degrees)	9	22.5	9	22.5	22	55.0

Table (3): Distribution of the studied nurses' practice related to Standard steps in sequence of environmental assessment (n=40)

Environmental assessment	Yes		No	
	No.	%	No.	%
Number of rooms is available and suitable for the patients numbers	40	100.0	0	0.0
Number of rooms is available and suitable for the patients conditions	40	100.0	0	0.0
Is their separated room for emergency cases	40	100.0	0	0.0
Number of bed suitable to patients numbers	40	100.0	0	0.0
Suitable number of health team	40	100.0	0	0.0
Availability of Supplies necessary for hand washing	1	3.3	39	97.5
Availability of PPE	37	92.5	3	7.5
Safe medication preparation (injection)	40	100.0	0	0.0
Routine disinfectant of the dialysis unit	40	100.0	0	0.0
Safe waste and sharp management	40	100.0	0	0.0
Suitable method environmental decontamination	3	7.5	37	92.5
Suitable frequency of environmental decontamination	3	7.5	37	92.5

Table (4): Total mean scores of the observation checklist for patients with hemodialysis(n=40)

Total practice	Total score	Mean	SD
Total aseptic technique	0-350	288.90	13.96
Invasive procedures	0-119	84.85	17.79
Noninvasive procedure	0-63	47.03	6.86
Cannulation of arteries	0-168	113.40	10.42
care of vascular accesses site	0-189	90.35	10.87
Initial hemodialysis	0-196	147.33	12.55
During the dialysis	0-130	115.90	7.90
Administering arteriovenous fistula	0-70	44.83	2.49
Administering center line	0-95	75.03	4.99
Administer central venous access device	0-84	40.75	3.97
Dealing with sharps	0-30	29.83	3.35
Dealing with blood/ blood products	0-28	24.20	5.51
Safe injection	0-77	60.65	7.46
Dialysis disinfection	0-112	92.80	4.97
Assessment of the environment	0-84	62.75	5.90

Table (5): Percentage distribution for total observation checklist for nurses (N. =40)

Variables	Done correct		Done incomplete correct		Not done	
	N	%	N	%	N	%
Total Aseptic technique practices , Hand hygiene, Gloves ,gown and mask	20	50.0	16	40.0	4	10.0
Total Specific precaution for dialysis	33	82.5	7	17.5	0	0
Invasive procedures	17	42.50	18	45.0	5	12.5
Non-invasive procedure	15	37.5	21	52.5	4	10.0
Cannulation of arteriovenous fistula	24	60.0	10	25.0	6	15.0
Administering IV Push	24	60.0	14	35.0	2	5.0
Safe injection practice	24	60.0	14	35.0	2	5.0
Dialysis station disinfection	19	47.5	21	52.5	0	0

Table (6): Percentage distribution for total nurses' compliance (N. =40)

Variables	Compliance		Non-compliance	
	No.	%	No.	%
A. General precaution				
Total Aseptic technique practices, Hand hygiene, Gloves, gown and mask	18	45.0	22	55.0
B. Specific precaution for dialysis:				
Total Specific precaution for dialysis Hemodialysis catheter care, connection, disconnection, Arteriovenous fistula/graft cannulation and Dec annulation	32	80.0	32	80.0
Standard steps in sequence (invasive procedures)	10	25.0	15	37.5
Standard steps in sequence(non-invasive procedur)	10	25.0	14	35.0
Cannulation of arteriovenous fistula (care, Accessing a vascular catheter, Initiation of hemodialysis care and Termination of hemodialysis care)	20	50.0	26	65.0
Administering IV Push Medications Through an Intermittent Device (IV Lock), Central Venous Access Device (CVAD), Dealing with sharp objects and blood, body secretions& fluids	16	40.0	18	45.0
Safe injection practice	16	40.0	18	45.0
Dialysis Station Routine Disinfection	14	35.0	14	35.0

Table (1): Shows that more than half of the studied nurses' ages from 20 to less than 30 years old and males (21(52.5%) and 24 (60%) respectively). The majority of them had a diploma education 35 (87.5%). Half of them their years of experience 10 years and more and three quarters of them attained training programs about infection control 30 (75%).

Table (2): Reveals that more than half of the studied nurses 22 (55.0%) had a poor knowledge level about infection control regarding hemodialysis**.**

Table (3): Reveals that 100% availability of equipment except Suitable method environmental decontamination, Suitable frequency of environmental decontamination and Availability of Supplies necessary for hand washing regarding Environmental assessment (7.5%,3.3%, respectively)

Table (4): Shows the total mean of aseptic technique 288.90 ± 13.96, invasive procedure 84.8 ± 17.78, non-invasive procedure 47.02 ± 6.86, cannulation of arteries 113.40 ± 10.42, accesses vascular site care 90.35 ± 10.86, initial hemodialysis 147.32 ± 12.55, during dialysis 115.90 ± 7.90, administration IV 44.82 ± 2.4, administering center line 75.02 ± 4.99, administer central venous access device 40.75 ± 3.96, dealing with sharps 29.82± 3.3, dealing with blood 24.20 ± 5.50, safe injection 60.65 ± 7.45, dialysis disinfection 92.80 ± 4.97

Table (5): Revealed that total aseptic technique perform correctly 20 (50%), and in complete correctly invasive procedure18 (45) and non-invasive procedure 21(52.5%). Complete correct for annulation of arteries 24(60%), safe injection 24(60%), incomplete correct regarding dialysis disinfection 21(52.5%)

Table (6): Showed that majority of the studied nurses noncompliance to all steps of observation checklist for patients undergoing hemodialysis.

Discussion:

The aim**s** of the present study is 3-folds: to assess nurses' knowledge and practice regarding aseptic technique in hemodialysis unit, assess nurses' compliance for aseptic technique at hemodialysis unit and designs suggested guidelines regarding aseptic technique at hemodialysis unit.

Based on the results of the present study, more than half of the nurses their ages ranged from 20-30 years, males, and have diploma of nursing and the majority of them their experiences were 10 years and more.

A study of **Tannor et al., (2017)** found that most of the participants working in dialysis unit were female. **Manera et al., (2019)** they reported that most of the participants had a diploma level of education. **Rasheed et al., (2018)** found that; the individuals' years of work experience ranged from 6 to 10 years.

At line with the current study findings, **Alnawafleh et al., (2021)** revealed that the majority of nurses were married, female, between the ages of 20 and 29, had a diploma, had fewer than 20 years of experience in hemodialysis units, and had in-service training courses linked to infection control precautions.

A study of **Thabet et al., (2019)** who indicated that after an employee's indoctrination, education and training are two components of staff development (which refers to planned, guided adjustment of employee to the organisation and work environment). The level of knowledge and capabilities of the staff have a big role in establishing the number of people needed to achieve unit goals. The more well-trained and skilled the personnel, the fewer people are needed, which saves money and improves reproducibility.

Data collected of the present study showed poor level of knowledge. Lack of funds to support continued education, a lack of interest or motivation, workload, and a supportive learning environment could all be hurdles to hemodialysis nurses accessing educational resources. According to the researcher, all studied nurses were not properly prepared prior to working and/or dealing with such hemodialysis patients, and they gained their experience while working and managing patients in real-life emergency situations, as evidenced by the data collected and analysed in the current study. This is supported by **Saleh et al., (2018)** who mentioned that the majority of nurses did not have access to a hospital-based professional development programme. Similarly, in Egypt, hemodialysis facility compliance with approved practise recommendations was not uniform. **(Ahmed et al., 2013).**

This result was in agreement with, **Amberson et al. (2020) & Ghirotto et al., (2020)** who reported that nurses had attended conferences in the previous 5 years because they were aware of the need for them to improve their quality of care.

Nurses with many years of experience do not require additional training before they are ready to take a patient assignment, according to a study by **Garbin & Chmielewski (2021).** Nurses with years of experience in one clinical specialty may require a moderate amount of training to acquire through a training programme**.**

The present study found that the mean scores of the nurses' performance were satisfy regarding the results. These findings may be due to the effect of receiving training program, and increase supervision of nurses by the head nurses.

According to the findings of this survey, all nurses had completed a training programme. This could be due to the nurses' desire to improve their performance and be prepared to handle any situation that the

patient presents. This could be a hospital policy for new nurses working in the hemodialysis unit. As a result, **Hirsh et al., (2020)** showed that implementing universal safeguards increases their overall performance. This finding is corroborated by **Mohamed et al., (2018)**, who claimed that all nurses should participate in an orientation programme, particularly in a specific area of nursing at hemodialysis unit. Also, **Hudson-Weires, (2020)** stated that an effective orientation programme reduces the chance of rule violations and misunderstandings, creates feelings of belonging and motivation, and improves the new employee's morale.

This discovery, on the other hand, is not consistent with, **Poorchangizi et al., (2019) & Linton, (2012)** who mentioned that in order to avoid stress and dissatisfaction in the workplace and to help new nurses develop the skills and confidence they need, orientation programs are required for unprepared new nurses.

However, **Cahill et al., (2021)** found that nurses must be held accountable and responsible for the patient's assessment, planning, intervention, teaching supervision, and evaluation of treatment in order to ensure that hemodialysis is performed safely.

A study of **Brundin-Mather et al., (2018)** observed that continuous data collection, documentation, and analysis of patient information before, during, and after hemodialysis is crucial to maintain and improve the quality of patient treatment.

The majority of the nurses in the current study did not follow infection control guidelines for hemodialysis patients. Hand-washing compliance was low in the current study due to awkward sink placements, inadequate time to complete the activity, a lack of role models, and a lack of precedence over other procedures.

According to **Grijota Camino et al., (2021),** supervision is the first step in ensuring that staff adheres to care standards. Furthermore, according to **Alqahtani (2020),** nurses' dedication to infection control strategies reduces sickness and mortality.

These findings, on the other hand, contradicted **Mailani & Bakri's (2020)** findings, which revealed that only about a third of the subjects in hemodialysis units follow (compliance) the recommended septic procedure practices.

A study of **Murali & Lonergan, (2020)** conducted that contradicted our findings, stating that in order to meet nursing performance standards, nurses must be appropriately educated, as insufficient educational preparation leads to poor compliance in the workplace. As **Milenkova et al., (2020)** mentioned, nurses' adherence to standard precautions is a critical component of nursing care, especially for ESRD patients to promote self-care.

A study of **Wallace et al., (2017)** concluded that Understanding the elements that may impact nurses' compliance with Standard Precautions is necessary for changing current behaviour.

The researcher opinion that Lack of expertise, the multi-procedures done in the dialysis unit, and a lack of materials, according to the study, may explain why nurses did not always follow the septic approach.

A study of **Salem et al., (2021)** attributed the lack of septic technique behaviours in hemodialysis units leads to noncompliance. This was supported by Ahmed et al., (2021), who stated that due to work stress, health care staff, mostly nurses, were less likely to observe conventional precautions in dialysis units. However, a study by Gilbert and **Kerridge (2019)** discovered that doctors were less compliant than nurses because to a lack of awareness about the necessity of infection prevention while interacting with dialysis patients.

In this regard, **Wahab et al., (2021)** highlighted the health care team's noncompliance with conventional precautions in dialysis units due to a lack of administration oversight. Furthermore, **Alhumaid et al., (2021)** cited emergency situations as a reason for failure to follow standard precautions.is in the same line with **Donati et al., (2019)** who mentioned that actual working conditions, such as dealing with unforeseen events, have a negative impact on the use of universal precautions. In addition, nurses ascribed their failure to follow universal precautions on a lack of knowledge. This is in line with **EL-Shafey et al., (2019)**, who discovered that health-care workers' compliance is more probable due to their awareness of universal precautions than non-compliance.

Major documented factors that affect compliance with standard precautions for dialysis patients, according to the literature, include but are not limited to a lack of awareness and education among healthcare staff. (**Al-Faouri et al., 2021).** Inadequate time to adopt precautions (work overload), limited resources, lack of suitable training, skin irritation, forgetfulness, distance from necessary facilities, and insufficient management assistance in creating a favorable work environment are all factors **(Akagbo et al., 2017).**

Furthermore, according to **Cruz (2019),** some sociodemographic characteristics such as age, sex, job type, marital status, working site in the hospital, and work experience are linked to hemodialysis standard precautions compliance.

Conclusion:

More than half of the studied nurses had a poor knowledge level about infection and infection control regarding hemodialysis. Total aseptic technique perform correctly. Majority of the studied nurses non

compliance to all steps of observation checklist for patients undergoing hemodialysis.

Recommendations

1. Simple educational pamphlet for nurses' work in the hemodialysis unite about the aseptic technique.
2. Apply developed program in the study setting for hemodialysis nurses regarding compliance standard precautions for continues updating their knowledge.
3. Continuous education and refreshment for nurses' knowledge and practice regarding infection control education in hemodialysis units.
4. The study should be replicated on large sample and different hospitals setting in order to generalize the results.

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