

## Assessment of Nurses Knowledge and Practices Regarding Complications of Hemodialysis Patients in Intensive Care Unit

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### Abstract

**Background:** Many dialysis patients still show uncontrolled hypertension, which is a major risk factor for cardiovascular morbidity. For this reason there is a clear need for more effective nurse assessment **Aim of the present study:** To assess the nurses knowledge and practices regarding complications of hemodialysis patients in Intensive Care Unite . **Research design:**A descriptive design was used in this study. **Sample :** A convenient sample of 30 nurses were included in the study. **Tools** for data collection were: **Tool I:** Nurses knowledge questionnaire .and **II:**Observation checklist **about** nurses practices regarding care of patient. **Results:** More than half of the studied nurses have unsatisfactory knowledge about hemodialysis complications and inadequate practice. **In conclusion:** There is highly statistical significant difference between the nurse knowledge and practice (P=0.001).**Recommendations:** In-service training programs and hemodialysis courses are essential for nurses to improve their knowledge and practice while working with hemodialysis patients.

**Keywords:** *Hemodialysis Complication, Knowledge & Practice.*

### Introduction

Hemodialysis is a therapeutic process that replaces poor functioning of the kidneys with the use of a semipermeable membrane that functions as a nephron to remove metabolism waste products and correct imbalances of liquids and electrolytes in patients who suffer from kidney failure ( **Ignatavicius et al., 2009**). Acute kidney injury (AKI), is a complex disorder with varying definitions, most including an abrupt decline in kidney function leading to a rise in serum creatinine and/or blood urea nitrogen levels, with or without a decrease in urine output (**Nephrology Nursing Journal, 2011**).

Despite advances in preventive strategies and support measures, acute kidney injury continues to be associated with high morbidity and mortality, particularly in those admitted to the ICU, where in-hospital mortality rates may exceed 50%. In addition to mortality rates generally reported to be in the 30%–70% range. There are chronic consequences even if the patients survive their acute illness, with a high risk of developing or exacerbating chronic kidney disease and hastened development of end-stage renal disease (**Hsu, et al., 2009**).

In the innovative days of hemodialysis, complications because of practical problems with the dialysis machines and water supply were very common. In today's world, the popular of problems are related to the limitations of the dialysis technique coupled with patient co-morbidity, for example hypotension as the result of a high ultra filtration target in response to

excessive inter dialytic weight gain, within a limited dialysis session time (**Keane, 2016**).

Hemodialysis nurses must have the professional capabilities to prepare the patient prior to hemodialysis, monitor the condition of the patient throughout hemodialysis process and teach the patients about correct diet and limitations of liquids, and provide support for self-care, while overseeing the entire process (**Kallenbac et al., 2005**). Comprehensive nursing care is expected to reduce and prevent complications experienced by the patient during the process of the therapy to improve the quality of life of the hemodialysis patient. The nursing profession uses the nursing process as the conceptual and practical framework in caring for patients. The nursing process consists of assessment, diagnosis, planning outcomes, planning intervention, implementation, and evaluation (**Wilkinson, 2007**).

### Significance of the study

Despite adequate dialysis, many dialysis patients still show uncontrolled hypertension, which is a major risk factor for cardiovascular morbidity. Other frequent complications during dialysis include post dialysis fatigue syndrome, nausea and vomiting, headache, pain, pruritus, and pyrogenic reaction (**Song, 2018**). So for these causes there is a clear need for more assessment of nurse knowledge and practices for complications of hemodialysis.

**Aim of the study**

The aim of the study was to assess nurses knowledge and practices for patients with hemodialysis complications in Intensive Care Unite.

**Research question:** What are the nurses knowledge and practices regarding complications of hemodialysis patients in intensive care unit?

**Ethics Consideration**

Research proposal was approved from ethical committee in the faculty of nursing.

- 1- There is no risk for study subjects during application of the research.
- 2- The study will follow common ethical principles in ethical research.
- 3- Oral consent was obtained from nurses participated in the study, after explaining the nature and purpose of the study.
- 4- Nurses had the right to refuse to participate and or withdraw from the study without any rational at any time.

**Subjects & Method**

**Research design:** A descriptive research design was used in this study

**Setting:** The study was conducted in the trauma ICU, obstetric ICU at Assiut University Hospital.

**Subjects:** A convenience sample of nurse (30 nurses)

**Study tools:** Data pertinent to the study were collected, utilizing the following two

**Tools:****Tool I: Nurses knowledge questionnaire**

A questionnaire schedule was developed by the researcher based on the review of current related literature. The overall purpose of this questionnaire was to assess the nurse's knowledge about complications of hemodialysis.

**The questionnaire schedule included 2 parts****Part I:** -Demographic characteristics

It is concerned with demographic characteristics of the nurses as. age, qualification, years of experience and previous attended training opportunities about hemodialysis.

**Part II**

This Part comprised questions related to the following categories

- 1- knowledge about acute renal injury .
- 2- Knowledge related to hemodialysis.
- 3- Knowledge related to nurse care to reduce hemodialysis complications.

**Tool II: Observation checklist**

This part cover the nurses practices regarding care of complications among patient in pre,intra,post dialysis

**Scoring system**

\*Total knowledge score (38) was classified as follows

-Satisfactory knowledge  $\geq 60\%$

-Unsatisfactory knowledge  $< 60\%$

\*Total practice score (210) was classified as follows

- Adequate  $> 90\%$

- In adequate  $< 63\%$

**Methods**

- An official permission to proceed with the proposed study was
- obtained from the head of the trauma and .obstetric intensive care units department as well as the hospital nursing director after explaining the aim and nature of the study.
- An approval was obtained from the local ethical committee and the study was followed the common ethical principles in clinical research.
- The tools used in this study were developed by the researcher based on reviewing the relevant literature.
- Content validity and reliability : The tools were tested for content related validity by jury of 5 specialists in the field of critical care nursing and critical care medicine from Assiut University. reliability were tested by using Cronbach's coefficient Alpha  $R=.801$
- Pilot study: was conducted on 7 nurses to test the feasibility and applicability of the tools. The analysis of the pilot study revealed that minimal modifications are required. These necessary modifications were done and the pilot study subjects were excluded from the actual study.
- Explain the aim and contents of the study to nursing supervisors and physicians to gain their cooperation during minimal workload activities.

**Statistical analysis**

The data obtained had reviewed, prepared for computer entry, coded, analyzed and tabulated. Descriptive statistics (frequencies and percentages, mean & standard deviation, Pearson correlation coefficients, Independent sample T-test, Chi-square and i.e.) were done using computer program (SPSS) version (25). It's considered significant when P. value less than (0.05).

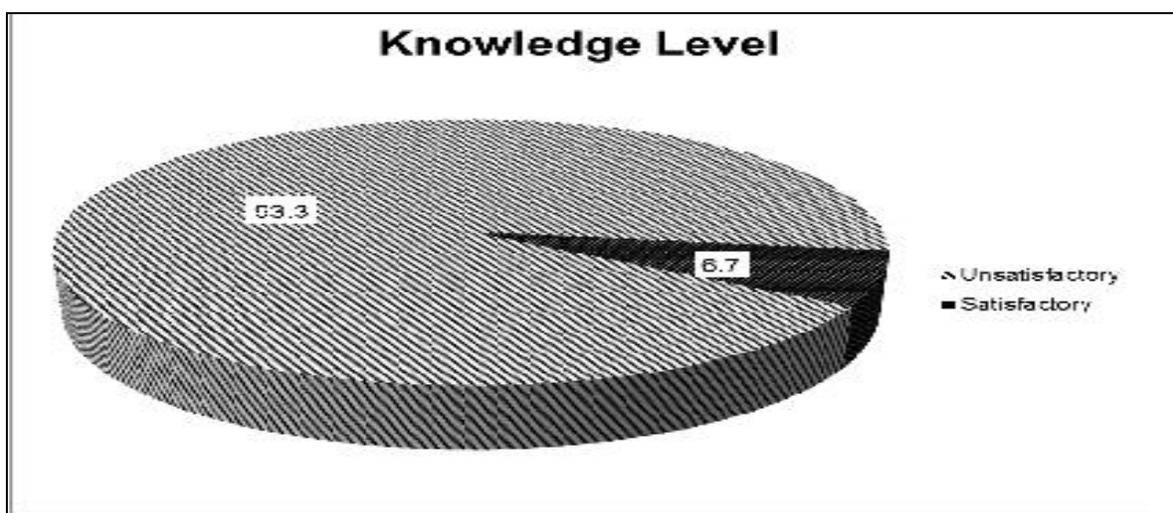
**Results**

**Table (1): Percent distribution of demographic characteristics of nurses.**

	No	%
<b>Age</b>		
<20 year	1	3.3
20>40 year	26	86.7
40 and more	3	10.0
<b>Educational Level</b>		
Diploma in nursing	17	56.7
Technician Institute of Nursing	13	43.3
<b>Experience by years</b>		
less than one year	3	10.0
1->5 years	5	16.7
5 -10 years	10	33.3
more than 10 years	12	40
<b>training courses about hemodialysis</b>		
Yes	24	80
No	6	20

**Table (2): Percent distribution of the studied critical care nurses level of knowledge of acute renal failure (No. = 30).**

Variable	(n=30)	
	No.	%
<b>Table (3): Percent distribution of the studied critical care nurses level of knowledge of hemodialysis (No. = 30)</b>		
incorrect	24	80.0
Correct	6	20.0
<b>Causes of acute renal failure</b>		
<b>Symptoms and signs of acute renal failure</b>		1.6±0.62
<b>Characteristics of acute renal failure</b>		1.63±0.81
incorrect	12	40.0
Correct	18	60.0
<b>Methods of treatment of renal failure</b>		
incorrect	9	30.0
Correct	21	70.0
<b>Symptoms of high acidity of blood</b>		
incorrect	10	33.3
Correct	20	66.7



**Figure (1): Distribution of the studied critical care nurses level of knowledge (No. =30).**

Table (4): Relationship between nurses Total Knowledge and demographic data.

Variable	Mean $\pm$ SD	P. value
<b>Age group</b>		
<20 year	55 $\pm$ 0	0.017*
20->40 year	38.38 $\pm$ 5.38	
40 and more	37.67 $\pm$ 4.73	
<b>Years of experience</b>		
Less than one year	43.67 $\pm$ 10.02	0.177
1-> 5 years	38.6 $\pm$ 4.28	
5-10 years	40.6 $\pm$ 7.31	
From 10 years and more	36.33 $\pm$ 3.14	
<b>Attending training courses regarding hemodialysis</b>		
Yes	38.29 $\pm$ 5.57	0.301
No	41.17 $\pm$ 7.57	

- independent t-test \* Significant difference at p. value < 0.05 - Anova test

Table (5): Distribution nurses level of practices regarding hemodialysis complications.

Variable	Highest possible score (%)	Level of practice	
		Achieved points	Level of practice
<b>Preparatory phase for patient and hemodialysis machine</b>	18(100%)	11.03(61.3%)	adequate
<b>procedure phase for patient and hemodialysis machine</b>	54(100%)	35.87(66.42%)	adequate
<b>Nursing care for hemodialysis complications</b>			
Fluid electrolytes	10(100%)	5.63(56.33%)	Inadequate
Oxygenation	16(100%)	3.87(24.17%)	Inadequate
hypertension	16(100%)	7.67(47.92%)	Inadequate
Anaphylactoid raction	10(100%)	5.13(51.33%)	Inadequate
Blood loss	16(100%)	6.93(43.33%)	Inadequate
Blood clotting	10(100%)	6.07(60.67%)	adequate
Sepsis	14(100%)	4.67(33.33%)	Inadequate
Air embolis	10(100%)	4.63(46.33%)	Inadequate
Hypotension	12(100%)	4.9(40.83%)	Inadequate
Cardiac arrhythmias	12(100%)	5.7(47.5%)	Inadequate
Disequilibrium Syndrome	12(100%)	5.9(49.17%)	Inadequate
<b>Total practice</b>	<b>210(100%)</b>	<b>108(51.43%)</b>	<b>Inadequate</b>

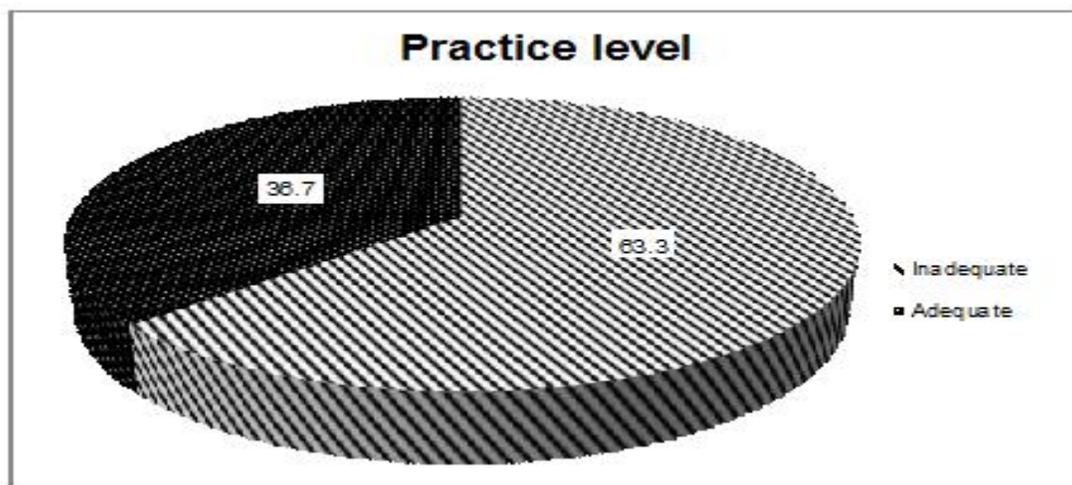
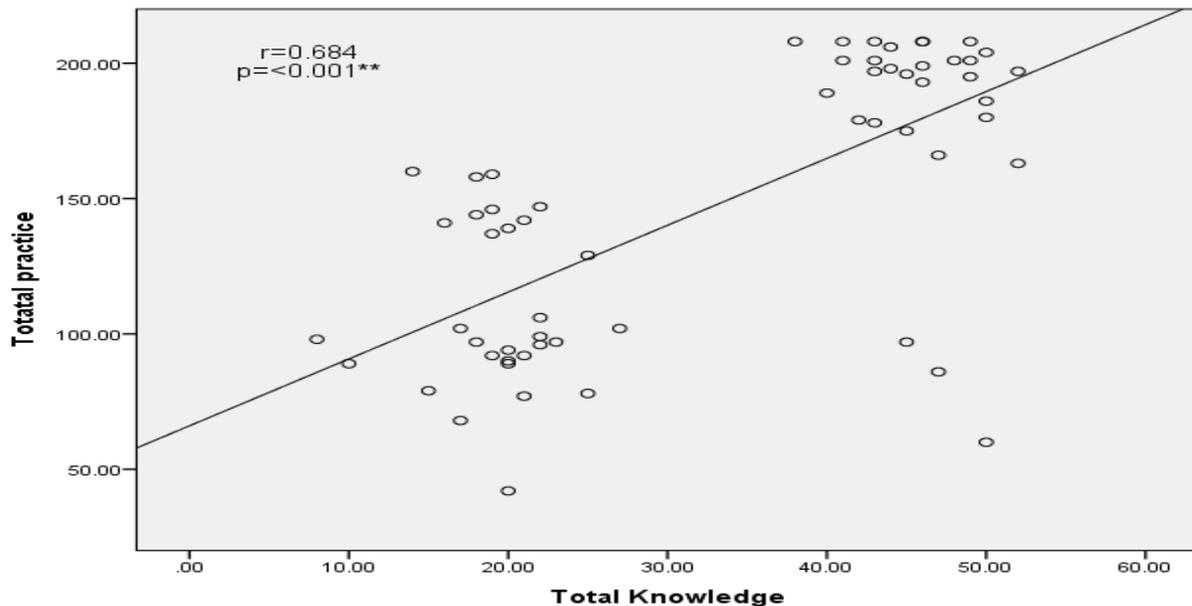


Figure (2): Distribution of nurse's level of practice (No. =30).



**Fig. (3): Correlation coefficient between Total nurses Knowledge and Total practices regarding hemodialysis complications.**

**Table (1):** Show that, the studied sample consists of 30 nurses

As regard to age ,the majority of nurses were at range more than 20 and less than 40 (86.7%), As regard to nursing diploma was the highest proportion (56.7%), (40.0%) of nurses had an experience From 10 years and more. As regard too previously of attended training courses were (80.0%)

**Table(2):** This table show that, more than two thirds of the studied nurses 80% have incorrect knowledge regarding definition of acute renal failure and more than half 60% have correct knowledge regarding Characteristics of acute renal failure, more than two thirds of the studied nurses 70% have correct knowledge regarding methods of treatment of renal failure **Table(3)** This table illustrates that, more than two thirds of the studied nurses have incorrect knowledge (93.3%) regarding definition of hemodialysis process and (93.3%) complications of the cardiovascular system,( 96.7%) complications of the digestive system , More than half of the studied nurses have correct knowledge about complications of the nervous system (66.7%) and complications of Skin (66.7%) and half of them have correct knowledge about complications of respiratory system(50%).

**Table (4):** Illustrate that, there were highly significant difference between nurses demographic data and their knowledge regarding age ( $p=0.17$ )

**Table(5):** Shows that, studied nurses have in adequate level of practice in all items except in preparatory and

procedure phase for patient and hemodialysis machine and blood clotting.

**Figure (1):** This figure shows that, the majority of the studied nurses have unsatisfactory knowledge (93.3%).

**Figure (2):** This figure show that, more than two thirds of the studied nurses have in adequate level of practice (63.3%).

**Figure (3):** Illustrate that, there was positive relationship between total knowledge and total practice ( $r=0.955$ )

## Discussion

Many dialysis patients still show uncontrolled hypertension, which is a major risk factor for morbidity. other frequent complications during dialysis include post dialysis fatigue syndrome, nausea and vomiting, headache, pain, pruritus, and pyrogenic reaction. Hemodialysis can cause the uncommon important complications such as dialysis disequilibrium syndrome, seizure, and hypoxia. Technical failures such as hemolysis, air embolism, and temperature fault can be life threatening (**Song 2018**).

The nurse should observe the patient constantly so that nurse must have knowledge and skills because they considered important features of quality nursing care in the hemodialysis treatment. Nurses role is vital for monitoring, identification, and intervention in complications. (**Rowe, 2017**).

The present study included 30 nurses, the majority nurses age was ranged between more than 20 and less

than 40 years old, this is agreed with the study of **Kuipers et al., (2016)**. Also the present study found that nursing diploma was the highest proportion, mean nurses experiences were ranged from 10 years to more than 10 years. This was disagreed with (**Thomas, et al., 2016**) who found higher representation of bachalriate and had less experience, had a nursing diploma their experience from 10 years and attended training courses.

The present study revealed that; more than half of the studied nurses have incorrect knowledge about definition and causes of acute renal failure this disagree with (**Wu, et al., 2016**). Who found no statistical significant deference occur after self-efficacy as a mediator application.

This study shows that;, more than half of the studied nurses have incorrect knowledge concerning definition of hemodialysis process and Complications of the circulatory system, complications of the digestive system this result disagreed with (**Wells, (2011)** in his research entitled “Hemodialysis knowledge and medical adherence in African Americans diagnosed with end stage renal disease: consequences of an educational intervention”. found that a significant rise in patients’ knowledge of treatment after intervention.

In our study, there was highly significant nurses knowledge about care of hemodialysis complications in all items except nurses role to reduce shortness of breath and nurse role to reduce bleeding.

(**Suwanwaha et al., 2018**) confirmed that; nurse level of knowledge about hemodialysis complication increased after program application.

There was a positive correlation between nurses’ knowledge and their practice regarding complications of hemodialysis patients. This may be attributed to suffecient training courses related to heamodialysis. However, the study of (**Butcher et al., 2018**) demondtrated that nurses must be accountable and responsible for the assessment, planning, intervention, teaching and evaluation of care to confirm that the patient will obtain safe heamodialysis.

These results agreed with care ( **Mottahedian et al., 2010**) who found that there was no correlation between nurses’ knowledge and their practice. The authors observed that these results appeared because of that the nursing staff did not attend a training conference in other center or sharing in continues nursing education concerning complication management during hemodialysis but they get their skill by daily practice experience only and from their colleague.

(**Mottahedian et al., 2010**), found that majority of the nurses were recognize how to correct a problem related with hemodialysis complications (clotted dialysis, complaining from hypotension, and half of

them know how to correct muscle spasm. Furthermore, other statement reported that although air embolism can occur during insertion of a hemodialysis catheter, it is more commonly seen as a complication of catheter removal.

This result is in compatible with **Mussa, (2013)** who found that most of the nurses had adequate cognizance regarding care of patients ‘s complications undergoing hemodialysis, , this result may appeared due to that most of the sample were college graduates (holding enough knowledge and qualification to learn and develop their skills day by day . (**Council of Physician & Nurse Supply in 2007**) released a statement calling for a national effort to substantially increase baccalaureate nursing programs. In the statement, the Council noted that a growing body of research supports the relationship between the level of nursing education and both the value and well-being of patient care.

The result of the present study revealed that there was adequate practices in hemodialysis preparatory phase in all items except in evaluation hours of treatment and review blood flow rate. This agree with (**Larsen 2018**) who indicated that; to successfully device chronic disease patient management and thereby facilitate the re organization of the delivery of health care, nurses do not simply train patients to be able to perform the long series of steps in preparatory phase of hemodialysis procedure perfectly but blindly; they employ elicited errors to provide patients with an understanding of the procedural that enable nurses to deal with problems, errors and other unintended events if and when they arise and whatever they may be.

The present study reported that; most of the nurse have un satisfactory level in procedure phase in all items except in access catheter or fistula ,connect arterial access to arterial blood line , place venous dialyzer tubing line into retaining clamps of the fluid receptacle on the side of the dialysis machine ,tape arterial cannula connection securely ,turn off blood pump ,set negative pressure and alarms.

This result disagreed with **Mottahedian et al., (2010)** who mentioned in their study entitled “Effect of programmed nursing care in prevention of hemodialysis complications” that nurse should care the patient during hemodialysis procedure as the following; connect arterial access to arterial blood line, place venous dialyzer tubing line into retaining clamps of the fluid receptacle on the side of the dialysis machine, tape arterial cannula connection securely ,turn off blood pump, set TMP or negative pressure and alarms. Where the present study didn’t found that among studied nurses.

**Campos et al., (2016)** reported in their research that; hypoxemia is the lethal pathway of a multitude of

respiratory pathologies. The measurement of oxygen saturation (SO<sub>2</sub>) is a basic and commonly used tool in clinical practice for patients undergoing hemodialysis. Both arterial oxygen saturation (SaO<sub>2</sub>) and central venous oxygen saturation (ScvO<sub>2</sub>) can be easily obtained in hemodialysis (HD) patients. We suggest that intra dialysis SO<sub>2</sub> may serve as a potential marker to identify HD patients at increased risk for morbidity and mortality.

The result of the present study revealed that; most of the nurses were unsatisfied about hypertension during hemodialysis session.

**Rahimi et al., (2006)** reported that one of the other causes for hospitalization of the hemodialysis patients was the blood pressure and volume overloading. Results showed that there is a significant difference between the two stages before and after intervention. The mean systolic and diastolic blood pressure before and after hemodialysis would decrease after acting the model.

The result of the current study revealed that; an adequate level regarding anaphylactic reaction during hemodialysis session, depending upon their severity. Initially, these were thought to be because of a "first use" of the dialyzer, although subsequent reports show for many years, it has been known that some patients may develop acute anaphylactic reactions when first connected to the hemodialysis extracorporeal circuit.

Patients complained of pruritus, chest tightness, angioedema with throat and laryngeal edema, numbness of the fingers, toes and lips, anxiety, hypertension, and/or hypotension (**Himmelfarb et al., 2008**).

Also, (**Himmelfarb et al., 2008**) reported that, such reactions could also occur in patients reusing dialyzers. It is now realized that some patients developed IgE antibodies to one of the sterilants. Usually, these reactions occurred when the dialyzer and lines had not been thoroughly rinsed before connection to the patient. In patients with documented ethylene oxide RAST IgE Complications during hemodialysis.

The results clarified that; there was an adequate level of practice regarding blood loss during hemodialysis session. This disagrees with (**Eckardt et al., 2018**) who found in their research that; an overall improvement was observed with end stage renal failure, particularly intradialytic complications. Patients with the highest incidence of intradialytic hemorrhage during conservative hemodialysis and free from chronic pre-dialysis hypotension seem to respond better. Inter-dialysis symptoms also seem to improve with control of blood volume.

Also, **Kishimoto et al., (2008)** showed that routine of nursing program leads to patients' life quality decreases the complications. Complications will happen because of high liquid loss (blood loss) or rapid liquid shift. These complications are hypotension, fatigue, chest pain, foot cramps, nausea and headache. These complications can be disallowed by regulation and control of the liquid shift speed and amount.

(**Murea et al., 2017**) stated that; during the study, nursing staff communicated the principal investigator in the event of early signs of extracorporeal circuit clotting or noticeable drops in the dialyzer reuse rate. Nurses record the condition of the dialyzer fibers, arterial header and venous header at the end of each hemodialysis session. Major clotting requiring break of the HD treatment, exhibit blood leakage, or are esthetically undesirable.

The result of the present study reveals that; most of the nurse was an adequate level about sepsis during hemodialysis session.

The survey of (**Bansal et al., 2018**) provides a snapshot of the status of vascular access care in hemodialysis patients and highlights need for pre-dialysis clinics, vascular access services and registry audits for any asepsis or infection. Also, **Bansal & Bansal, (2014)** mentioned that; nurses frequently check for entrance of running dialysis, prevents any more infection or abscess.

As regards nursing performance toward air embolism during hemodialysis session there was an adequate level of practice, dialysis nurses had observed extensive foam in the venous air trap when performing dialysis with dialysis devices. This led to a systematic investigation of the possible underlying causes. Especially during hemodialysis post dilution, dialysis nurses informed extensive foam in the venous chamber. (**Jonsson et al., 2018**)

The present study demonstrated that; most of the nurses have an adequate level of practice about hypotension during hemodialysis session. Regarding hypotension during hemodialysis, the results showed that the programmed control method had a significant effect. A study which was conducted by **Jihong (2009)** on hypotension prevention and nursing care of the patients under hemodialysis concluded that prevention was the main key to treatment of hypotension during hemodialysis. In this study, nutritional education to patients reduced hypotension from 57.6% to 15.7%, which is in proportion to the present research.

From the current results it was found that; there was an adequate level about cardiac arrhythmias during hemodialysis session. This finding agrees with **Ruggeri et al., (2015)** & **Haras, (2015)**, who demonstrated that; dyskalemia is known to cause

cardiac arrhythmias and cardiac arrest. In persons undergoing hemodialysis, potassium dialysate composition has been identified as a causative factor in addition to co-morbidities, medications, dietary potassium intake, and stage of kidney disease.

Present evidence recommends a thorough evaluation of all factors affecting potassium balance, and lower potassium concentration should be used carefully in patients who are likely to develop cardiac arrhythmias. Nephrology nurses show a key role in patient assessment and education related to potassium balance.

Disequilibrium Syndrome during hemodialysis is a highly mutable including nonspecific complications such as nausea, vomiting, fatigue, tremors or hypertension. The first step for prevention and early treatment of disequilibrium is classifying patients at risk. (Bansal & Bansal, 2014).

Hemodialysis can cause the uncommon significant complications such as dialysis disequilibrium syndrome, seizure, and hypoxia. Technical failures such as hemolysis, air embolism, and temperature malfunction can be life threatening. (Song, 2018)

Finally, it can be concluded that, the educational program for intensive care unite working with patients undergoing hemodialysis by improving nurses' knowledge and performance regarding hemodialysis complications, this was supported by Shafeik et al., (2018), who stated that specialized nurses have a large role to play in minimizing and preventing hemodialysis complications

### Conclusion

**Based on the result of the study**, it was concluded that nurses in traumatic and obstetric intensive care units at Assiut university Hospital had lacking the necessary basic knowledge and practices related to complications of hemodialysis. There is highly statistical significant difference between the nurse knowledge and practices ( $P=0.001$ ). Improving nurses' knowledge and practices have a favorable effect in preventing or reducing complications of hemodialysis

### Recommendations

**Based on results of the present study the following can be recommended**

Continued nursing education and in service training programs at intensive care units should be organized within Assiut University Hospital which will be reflected on better outcomes for patients.

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