

Nurses Knowledge and Practice Regarding Intradialytic Complications for Hemodialysis Patient

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Abstract: Despite hemodialysis effectiveness and it can prolong life indefinitely, patients suffer many intradialytic complications that may be life threatening. The aim of the present study was to assess nursing knowledge and practice regarding intradialytic complications. A descriptive design was adopted to conduct this study. The study was conducted at two units, at the Urology and Nephrology Center in Mansoura City. Two tools were used to conduct this study namely a self administered questionnaire to assess nurses' knowledge and observation checklist to assess nurse's practice regarding hemodialysis process and intradialytic complications. Study results revealed that the most of them had satisfactory level of knowledge related to care of dialysis complications. The majority of them deal adequately with hemodialysis complications. Conclusion nurses having satisfactory level of knowledge have also adequate practice. The study recommended in-service education program for nurses for continuous up-dating and renewal of their knowledge and skills to maintain and improve level of practice, Increase awareness of nurses through conferences about control and preparation of dialysis machine especially cooling dialysis and increased dialysate flow, which reduce the rate of intradialytic hypotension and increase the efficiency of hemodialysis treatment.

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1. Introduction:

Severe decrease of renal function, either acute or chronic, is a threat for life (**Guyton & Hall, 2006**). Uremic syndrome is a complex phenomenon leading to dysfunction of many organ systems in the body (**Himmelfarb, 2005**). The patient quality of life can be promoted and the complications of renal failure can decrease with sufficient and effective hemodialysis (**Monfared et al., 2009**). Hemodialysis is now a standardized therapy and used as a life-sustaining therapy for more than 300,000 patients in the United States who have end-stage renal disease (**Himmelfarb, 2005**).

Despite the many technical advances in medical care and dialysis delivery that have been made over the last few years, mortality and morbidity rates remain high and the QOL of uremic patient is still poor (**Locatelli, 2005**).

The most common complications during hemodialysis are in descending order of frequency, hypotension (20-30%), cramps (5-20%), nausea and vomiting (5-15%), headache (5%), chest pain (2-5%), back pain (2-5%), itching (5%), ad fever and chills (less than 1%) (**Sherman et al., 2007**).

The patient and the dialysis apparatus should be under supervision of nurses consistently, so that different potential complications can be detected. Dialysis nurses must have knowledge and skills, because they considered important features of quality nursing care in the hemodialysis treatment (**Kallenbach et al., 2005; Bennet, 2010**). Nurse's

role is essential for monitoring, identification, and intervention in such complications and that this role also is differential to obtain quality in hemodialysis procedure (**Nascimento & Marques, 2005**). On the same way, **Rosdahl and Kowalski (2008)** pointed that specific nursing interventions include obtaining weight, hourly intake and output measurements, vital signs and homodynamic status are essential.

When appropriate interventions are available early in the course of management, the potential for better health improves, and the patient can remain active in family and community life. Furthermore, mentioned that the health care team provides the information and support for patients and their families on how to preserve and protect their quality of life (**Butlerly & Schwab 2000; Smeltzer & Bare, 2004**).

Aim of the Study

The aim of this study is to assess the nurses' knowledge and practice regarding intradialytic complications.

Research Question

What is the nurses' knowledge and practice regarding intradialytic complications?

2. Research design:

A descriptive design was adopted to conduct this study.

Setting:

The study was conducted at two hemodialysis

units in the Urology and Nephrology Center, Mansoura city. The first unit is the Urology and Nephrology Center for emergency and admitted cases, the second unit is the Out-patient Clinic of Urology and Nephrology Center for chronic renal failure patients.

Subjects:

The study sample included all nurses working at the two hemodialysis units in Urology and Nephrology Center except the pilot study.

Sample size:

The total number of available nurses was 40. They were all included in the study sample. In order to increase the precision of estimates, each nurse was observed to provide care for five patients. This increased the sample size to 200 for nurses' practice. This sample size was large enough to determine the prevalence of adequate practice of 50% or more, with 5% standard error and a 95% level of confidence. Using the single proportion equation for dichotomous variables (Epi-info 6.04), the estimated sample size is 166 subjects. After adjustment for a dropout rate of about 15% it would be 200 subjects.

Tools for data collection:

Two tools were used for collecting data, namely a self administered questionnaire and an observation checklist.

A- Questionnaire sheet which include:

It was constructed by the researcher based on review of literature. It included the following items:

- **First part: Personal data such as:** age, nursing qualification, total years of experience and marital status.
- **Second part: Nurses knowledge about hemodialysis and its complications:**

This section contained six categories of knowledge:

First category:-

It consists of items related to hemodialysis such as: definition and pre-session assessment of patient (Questions 1 & 2).

Second category:

It covers the intradialytic complications and nursing role, such as; hypotension, muscle cramps, cerebral disequilibrium syndrome, arrhythmias, blood loss, anaphylaxis, air embolism, clotting and sepsis (Questions 3-27).

Third category:

This is formed of items related to heparin, such as indications and contraindications of heparin for hemodialysis patients (Questions 28 & 29).

Fourth category:

It is concerned with patient' weight change, such as; signs of over load, ideal weight gain between sessions and complications of over weight gain (Questions 30-32).

Fifth category:

It deals with the machine preparation and control, such as; how to increase efficiency of

hemodialysis, ideal pump flow rate and importance of cool dialysis (Questions 33-35).

Sixth category:

It is related to ending of session, such as; post hemodialysis patient assessment (Question 36).

Scoring of the scale:

For the knowledge items, a correct response was scored 1 and the incorrect one zero. For each area of knowledge, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score. Knowledge was considered satisfactory if the percent score was 60% or more and unsatisfactory if less than 60%.

B- Observation checklist:

This was designed by the researcher for assessment of nurses' practice throughout dialysis process regarding intradialytic complications. The items of the checklist were checked along a continuum of 1-2 representing the following: 1, Done; and 2- Not done.

A not applicable category was allocated for the items which are not applicable to the situation.

Scoring system:-

Practice: The items observed to be done were scored "1" and the items not done were scored "0". For each area, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score. The practice was considered adequate if the percent score was 60% or more and inadequate if less than 60%.

II. Operational Design:

The operational design for the present study included, preparatory phase, pilot study and field work.

B- Pilot study:

A pilot study was conducted on 10% of the study sample to test the- applicability of the tools and techniques, and to estimate the time required to fill the forms. According to the results of the pilot study, some items were modified, omitted or added those who participated in the pilot study were excluded from the main study sample.

C- Field work:

The researcher started by reviewing the related literature to gain more in-depth information about the subject, and to be able to design the appropriate data collection tools. This took about three months. Then, the developed tools were reviewed by experts in nursing, a statistician and urologist for validation, this stage was completed in two months. When the tools were finalized after pilot testing, the actual field work started.

After obtaining official permissions, the researcher started to explain the aim of the study to participant nurses and they were reassured that the information obtained is strictly confidential. The duration of data collection lasted five months

starting from beginning of August 2010 to end of December 2010; the researcher was present at the study settings four days/ week from 8.00 a.m to 2.00 p.m.

III. Administrative design:

An official permission was obtained from the directors of the Urology and Nephrology Center. This was done by submission of a formal letter from the Dean of the Faculty of Nursing to them explaining the objectives of the study.

Ethical considerations:

Agreement for participations was taken from the nurses after the aim and objectives of the study were explained to them. They were given the opportunity to refuse the participation and they were notified that they could withdraw at any phase of research if they want without giving any reasons. As well they were assured that all information would remain confidential and would be used for the research purpose only.

IV- Statistical Design:

Data entry and statistical analysis were done using the statistical package for social services (SPSS) 14.0 version. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations for quantitative variables. Qualitative categorical variables were compared using chi-square test. Whenever the expected value in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. Statistical significance was considered at p -value <0.05 .

3. Results

Table 1: shows that more than one half (52.5%) of nurses were 30 years or above with a mean age of 34.2 ± 10.3 years. More than two thirds (67.5%) of them had diploma degree in nursing. Regarding nurses' experience more than two third (65%) of nurses had 10 years or more of experience with a mean 15.0 ± 10.7 years and 82, 5% of them were married.

Table 2: indicated that (85%) of the studied nurses reported satisfactory high level of knowledge related to definition of hemodialysis, and (57.5%) had satisfactory knowledge about pre-session patient's assessment.

As regard the complications occur during hemodialysis the highest level of reported satisfactory knowledge related to hypotension, sepsis, anaphylaxis, cerebral disequilibrium syndrome and clotting (85%, 72.5%, 65%, 65% and 60% respectively) while the low satisfactory level of nurses knowledge were related to blood loss, air embolism, muscle cramps and arrhythmias (47.5%, 40.%, 37.5% and 25% respectively).

Concerning observing patient's weight and heparin used the results revealed 92.5% of nurses had satisfactory level of knowledge about observing patients weight and most of them (80%) reported

satisfactory level of knowledge about indication and contraindication of heparin used. On the other hand the lowest percentage of satisfactory level of knowledge was related their role in control and preparation of machine (40%) and post hemodialysis assessment of patient condition.

Figure (1): portrays **Nurses total knowledge about hemodialysis and its complications.** According to this figure 62.5% of nurses reported satisfactory level of knowledge and 37.5% mentioned unsatisfactory knowledge.

Table 3: shows the correct nurses' practices related to some intradialytic complications. In case of hypotension all nurses measure frequently blood pressure, give 100-200 ml normal saline, stop ultrafiltration and hemodialysis session, while 89.3% put patient in Trendelenburg position, and 76.8% put O₂ mask.

In cardiac arrhythmias all nurses decrease blood flow rate, 97.4% notify physician, and make ECG, while 78.9% measured pulse rate and Bp and 60.5% put O₂ mask, and only 37.8% stop the ultrafiltration. On the other hand, all nurses' practices had correctly in relation to anaphylactoid reaction management.

Table 4: indicates the observed nurses' corrected practices regarding to some intradialytic complications. According to the table, all nurses practice correctly care of muscle cramps by give 200-300 ml saline or glucose, measure frequently blood pressure, measure body weight, adjust for dry weight and stop ultrafiltration if cramping is not corrected. While 51% apply stretching exercise and only 40.8% give O₂. On the other hand, all nurses correctly practice the care of cerebral disequilibrium syndrome.

Concerning management of air embolism all nurses correctly clamp the venous line immediately, aspirate the air from catheter by syringe and notify physician, while only 25% of nurses place patient in left lateral position with head and chest down, and 75% administer 100% O₂ mask.

Table 6: Illustrates that there were no statistical significant relation between nurses knowledge and their total practice. (P -value >0.05)

The table shows that 60% of nurses who had inadequate total intradialytic practice had unsatisfactory level of knowledge, while all nurses who had adequate practice of hemodialysis complications had satisfactory level of knowledge.

Concerning total practice of hemodialysis, 64% of nurses who had adequate practices had satisfactory level knowledge.

Figure (2): Illustrated **Nurses total practice about intradialytic complications.** According to this figure 81.5% of nurses had adequate total complications management.

Table 5: indicates that all the studied nurses correctly practice process of blood loss, and most of them (91.7%) clean the site of bleeding by cotton

socked with warm water, and change water proof sheet by another sterilized one after blood loss management.

The same table shows that all studied nurses (100%) correctly practice the complication of blood clotting and sepsis.

Table 1: Personal characteristics of the studied nurses (n=40)

Demographic characteristics	Frequency	Percent
Age (Years)		
<30	19	47.5
30+	21	52.5
Range	18.0-49.0	
Mean±SD	34.2±10.3	
Qualification:		
Nursing school diploma	27	67.5
Bachelor of nursing	13	32.5
Experience (Years)		
<10	14	35.0
10+	26	65.0
Range	1.0-30.0	
Mean±SD	15.0±10.7	
Marital status:		
Unmarried	7	17.5
Married	33	82.5

Table 2: Distribution of the study nurse according to their satisfactory of knowledge about hemodialysis and its complications (n=40)

Satisfactory knowledge (60%+)	Frequency	Percent
Definition of hemodialysis	34	85.0
Pre-session patient assessment	23	57.5
Complications during hemodialysis		
Hypotension	34	85.0
Muscle cramps	15	37.5
Cerebral disequilibrium	26	65.0
Arrhythmias	10	25.0
Blood loss	19	47.5
Anaphylaxis	26	65.0
Air embolism	16	40.0
Clotting	24	60.0
Sepsis	29	72.5
Heparin indication and contraindication	32	80.0
Patient weight change	37	92.5
Machine control and preparation	16	40.0
Ending session(post session patient assessment)	15	37.5

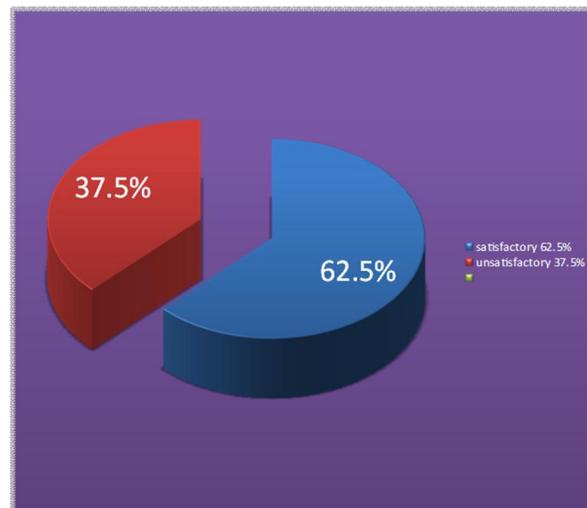


Figure 1: Nurses total knowledge about hemodialysis and its complications.

Table 3: Observed nurses' correct practices for some intradialytic complications (hypotension, arrhythmias and anaphylactoid reaction) (n=200).

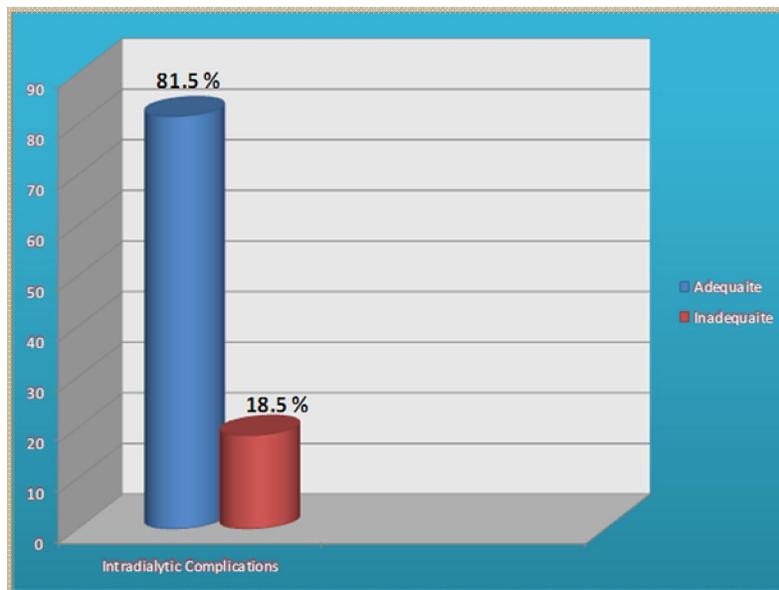
Intradialytic Complications	Frequency	%	NA
Hypotension			
• Place the patient in Trendelenburg position (head down)	50	89.3	0
• Give 100 to 200 ml normal saline (IV) in the circuit line to the patient	56	100.0	0
• Frequent measurement of blood pressure	56	100.0	0
• Stop of ultrafiltration (UF)	50	100.0	6
• Temporary stop of hemodialysis session	51	100.0	5
• 100% O ₂ mask	43	76.8	0
Cardiac arrhythmias			
• Measuring of pulse rate and blood pressure	30	78.9	0
• Decrease blood flow rate	38	100.0	0
• Stop the ultrafiltration	14	37.8	1
• O ₂ mask	23	60.5	0
• Notify the physician	37	97.4	0
• Make ECG	37	97.4	0
Anaphylactoid reaction			
• Stop hemodialysis session immediately	11	100.0	0
• Clamp the blood line	11	100.0	0
• Discard the blood line and dialyzer	11	100.0	0
• Use another dialyzer membrane and circuit line	11	100.0	0
• Rinse the new dialyzer and circuit line with 1000 ml normal saline with slowly pump	11	100.0	0

Table 4: Observed correct nurses' practices regarding some types of intradialytic complications (muscle cramps, cerebral disequilibrium syndrome and air embolism) (n=200).

Intradialytic Complications	Frequency	Percent	NA
Muscle cramping			
• Give 200 to 300 ml normal saline or glucose intravenous within circuit line to the patient	49	100.0	0
• Stretching exercise	25	51.0	0
• Frequent measuring of blood pressure	49	100.0	0
• O ₂ mask	20	40.8	0
• Stop ultrafiltration if cramping is not corrected	42	100.0	7
• Adjustment of dry weight	39	100.0	10
• Measuring body weight of the patient	49	100.0	0
Cerebral disequilibrium syndrome			
• Stop the ultrafiltration	4	100.0	0
• Return the blood to the patient	4	100.0	0
• Provide normal saline to the patient by circuit line	4	100.0	0
• Measure blood pressure	4	100.0	0
• 100% O ₂ mask	4	100.0	0
• Notify the physician	4	100.0	0
Air embolism			
• Clamp the venous line immediately	1	100.0	3
• Place the patient in left lateral position with head and chest down (Trendelenburg position)	1	25.0	0
• Aspirate the air from catheter by syringe or continuous hemodialysis session	4	100.0	0
• Administer 100% O ₂ mask	3	75.0	0
• Notify the physician	4	100.0	0

Table 5: Correct practices of management of intradialytic complications of blood loss, blood clotting and sepsis as observed among nurses in the total sample of patients (n=200).

Intradialytic complications	Frequency	%	NA
Blood loss			
• Stop the blood pump	36	100.0	0
• Make gentle pressure at the site of bleeding immediately until stopped and apply gel foam to the puncture site	36	100.0	0
• Clean the site of bleeding by cotton soaked with warm water	33	91.7	0
• Return the circuit line blood to another peripheral vein	9	100.0	27
• Change water proof sheet by another sterilized one	33	91.7	0
• Insert a new needle if dislodge	8	100.0	28
• Continue hemodialysis session	36	100.0	0
Blood clotting			
• Clamp the line with discard	49	100.0	0
• Connect the patient with a new circuit line rinsing with heparinized saline	49	100.0	0
• Flush the rinsing to drain and don't return to the patient	49	100.0	0
• Make complete blood count	2	100.0	47
• Make priming every 30 min with 500 ml saline (rinsing the circuit line or heparin observation	49	100.0	0
Sepsis			
• Notify the physician	19	100.0	
• Good sterilization of sepsis area with betadin and alcohol	19	100.0	
• Use antibiotic as gentamicin over the sepsis area	19	100.0	
• Measuring vital signs frequently	19	100.0	
• Give medications as antibiotics as doctors order	19	100.0	

**Figure (2): Nurses total practice about intradialytic complications.****Table 6: Relation between nurses' knowledge and practice**

Practice	Knowledge				X ² Test	P-Value
	Satisfactory		Unsatisfactory			
	No	%	No	%		
Total intra-dialytic						
Adequate	14	56.0	6	40.0	0.96	0.33
Inadequate	11	44.0	9	60.0		
Total complication						
Adequate	25	100.0	13	86.7	Fisher	0.13
Inadequate	0	0.0	2	13.3		
Total practice						
Adequate	16	64.0	8	53.3	0.44	0.50
Inadequate	9	32.0	7	46.7		

4. Discussion

Intradialytic complications are a constant threat for hemodialysis patients and dialysis staff (Teta, 2008). Hypotension and fatal needle disconnections are very commonly occurred during hemodialysis (Ward & Ronco, 2009). Additionally, Wingard, (2009) mentioned that muscle cramp, nausea and vomiting, dysrhythmias, air emboli and etc, are some other complications which happen through the treatment.

The nurse plays an important role in the control and protection of the patient. Events and complications due to dialysis (especially sudden events through dialysis that can cause dangers such as death) can be prevented and patients' lives can increase with suitable care through the treatment period and appropriate nursing management with hemodialysis ((Brunner & Suddarth, 2008; Tabrizi *et al.*, 2009).

Regarding nurse's knowledge of hemodialysis and complications, the results of the study revealed that nurses had unsatisfactory knowledge about muscle cramps, air embolism, arrhythmias, blood loss, machine control, and ending session of hemodialysis.

Although muscle cramps are considered a common problem during dialysis and occur in up to 90% of dialysis treatments (Levy *et al.*, 2009) nurses had unsatisfactory knowledge. This is explained by insufficient information that they obtained and the knowledge that they applied due to barriers to education as time consuming. In this respect, Levy *et al.* (2009) emphasized that cramps are increased in patients using low sodium dialysate and requiring increased ultrafiltration (UF). On the same way, Daugirdas *et al.* (2007) emphasized that nurses must be acquainted with this knowledge to know how to manage this problem which is summarized in using hypertonic solutions (saline, glucose, & mannitol) to control and prevent muscle cramps.

Similarly, nurses had unsatisfactory knowledge regarding blood loss. This is explained by lack of in-service educational programs for nurses. Nurses must have knowledge about preventive measures of blood loss to reinforce their practices which include secure the wing tips of the needles to the skin with adhesive tape to preventing dislodgements (Kowalak *et al.*, 2009).

Keeping all needles and blood line connections from being covered with blankets or other items so that staff can monitor the connections because when a hemodialysis blood line disconnects or needle dislodges from the patient's access vein or artery the consequences can range from minimal blood loss to a fatal hemorrhage particularly with venous needle dislodgements the mortality rate from these events is 10% to 33% (Hurst, 2009). Furthermore rinsing

back all blood and to hold firm but nonocclusive pressure on access site until the risk of bleeding has passed as identified by Lewis *et al.* (2007).

On the same way nurses under study had unsatisfactory knowledge about the important one after ending procedures of hemodialysis treatment. This is explained by lack of nurse's awareness about importance of monitoring the vascular access after hemodialysis session. On the other hand, Mayer *et al.* (2002) stressed that after completion of hemodialysis the nurses must be monitoring the vascular access for bleeding. Consequently, bleeding is considered a life threatening after needles removed from AV access and nurses must have knowledge about appropriate nursing management after needles removed from AV access (Rosdahl & Kowalski, 2008).

From the researcher point of view, the nurses should know the dangerous signs and symptoms that must be observed and reported by the patients for detecting any deviation from normal. Consequently nurse's knowledge regarding intradialytic complications is very variable in the current study, which is reflected on their health behaviors and practice to prevent the hazards of intradialytic complications. Keen *et al.* (1998) in their study, mentioned that knowledge governs the actions that they perform on behalf of, or in conjunction with, people who require nursing care. Similarly, knowledge and skills were considered important features of quality nursing care in the hemodialysis treatment Bennett, (2010).

Regarding the total nurses' correct practices of management of hemodialysis complications among nurses, the study findings showed that the majority of nurses had adequate practice regarding hypotension management. This is might be attributed to that hypotension is more prevalent among patients on long term hemodialysis so nurses are familiar with hypotension management, which include stopping or slowing the rate of ultrafiltration, placing the patient in the Trendelenburg position, decreasing the blood flow rate, and restoring intravascular volume (Tatsuya *et al.*, 2004).

Regarding nurses' practices toward cerebral disequilibrium syndrome, the current study results revealed that all of the nurses had adequate practices which include stop the dialysis, notify the physician if signs of disequilibrium syndrome occurs, prepare to administer intravenous hypertonic saline solution, albumin, or mannitol (Osmitol) by circuit line if prescribed and taking the vital signs. All these practices were mentioned by Silvestri, (2008). Additionally, cerebral disequilibrium syndrome is fatal problem in patients suffering from end stage of renal failure undergoing hemodialysis for the first and rapid removal of urea during hemodialysis (Sheikh *et al.*,

2010). Consequently, the nurses must be acquainted with the treatment strategies to reduce disequilibrium of cerebral syndrome by using a dialyzer with smaller surface area, decreasing the rate of blood and dialysate flows, circulating the blood and dialysate in a concurrent direction (rather than countercurrent) or decreasing the dialysis time and using high dialysate sodium as clarified by **Himmelfarb, (2005)**.

The current study findings revealed that all of studied sample had adequate practices regarding anaphylactoid reaction. This could be as explained as the nurses were well trained regarding the management of this problem through rinsing the blood compartment of the dialyzer with several liters of saline and rinsing the dialysate compartment with dialysate before the use of dialyzer This finding is congruent with **Brenner, (2000)**.

On the same way, the result of the current study indicated that the studied sample had adequate practices regarding blood loss. This finding could be explained by nurses having high skills regarding the appropriate management of this complication, when needle site is bleeding, which includes direct pressure as the simplest and effective measure that should be aseptically performed and with extreme care to avoid AV access occlusion, applying gel foam to the puncture site, adjusting heparin dose, and changing the puncture site every dialysis are all procedures performed by the nurse. If the blood lines separated or dialysis needles accidentally become dislodged, the arterial cannula is clamped first to control excessive blood loss from the arterial system and then the venous cannula is clamped (**Ahrens et al., 2007**). On the same way, the **National Kidney Foundation, (2006)** highlighted that if there is disconnect in the tubes, and blood is seen or felt the nurse should clamp or put pressure on the site of bleeding until stopped.

Moreover, the present study result showed that all of the studied sample had adequate practices regarding blood clotting. This might be attributed to that nurses were dealing appropriately regarding management of blood clotting, which includes remove the clotted system, prime catheters or fistula with normal saline, prime new system and connect it with catheter or AV access and start predilution with 1000 ml saline 0.9% solution per hour (**Urden et al., 2004**).

The present study finding showed that all nurses of the studied sample had adequate practices regarding the infection control of central venous catheter (double lumen catheter). This might be due to that catheter sepsis is a fatal complication in hemodialysis patient so nurses were well trained regarding infection control and standard precautions. Similarly, **Bakk, (2010)** mentioned that catheter related infections is a significant

health problem leading to increased hospitalizations, morbidity and mortality. Furthermore about 15 to 20% of deaths among hemodialysis patients are due to infection with the majority related to the venous access site (**Bledose & Benner, 2006**).

The current study findings revealed that approximately one half of studied sample had inadequate management of muscle cramps in relation to stretching exercise. This could be attributed to that this process (stretching exercise) is neglected because majority of nurses had unsatisfactory knowledge about its importance of pain relief as mentioned by **Yaaghoobi et al. (2008)**, who studied 35 patients under hemodialysis and showed that isometric and isotonic exercise program for these patients cause prevention and decrease of muscle cramps. On the same way, **Daugirdas et al. (2007)** clarified that force stretching of the muscle involved (e.g., ankle flexion for calf cramping) may provide relief. Massage varies in its utility on an individual basis. Additionally sequential compression devices (SCD) improve venous return (VR) and are commonly used to prevent lower extremity (LE) deep venous thrombosis in hospitals (**Ahsan et al., 2004**).

On the same way, approximately one half of studied nurses had inadequate practices regarding arrhythmias. This might be due to that the majority of nurses had unsatisfactory knowledge about this problem although this complication is more common in patients with left ventricular diastolic dysfunction and occurs frequently with estimates of up to 50% as detected by **Atar et al. (2006)**.

The present study result showed that only one quarter of studied sample had adequate management practice of air embolism through placing the patient in left lateral position with head and chest down. This might be attributed to the nurses had unsatisfactory knowledge regarding air embolism. This deficient knowledge and inadequate practice might be due to the cause behind the rarity of the occurrence of this problem as mentioned by **Riddick and Brogdon, (2010)** who stated that, air embolism is extremely rare because of the safe guards built into the apparatus and procedures currently used. Inadequate management lead to serious complications such as air which tends to enter the heart generates foam in the right ventricle and passes into the lungs or the brain and heart and causes acute neurologic and cardiac dysfunction (**Daugirdas et al., 2007**).

Concerning relationship between nurses' knowledge and practices, the present study result revealed that three fifths of nurses who had unsatisfactory knowledge had inadequate total intradialytic practice and all of the nurses who had satisfactory knowledge had adequate total complication management. These findings mean that nurses' performance increased with

improvement of their knowledge. Therefore, the WHO, (2004) has suggested that attending in-service education programs, national conferences and continuing formal education are necessary for keeping knowledge and practice up-to-date.

Conclusion

From the finding of the current study conclusion can be deduced the following:

- The majority of the studied nurses reported satisfactory knowledge about definition of hemodialysis, and more than half had satisfactory knowledge about pre-dialysis assessment of patient condition.
- Nurses had satisfactory level of knowledge related to care of dialysis complications (hypotension, sepsis, anaphylaxis, cerebral disequilibrium syndrome). As well less than half reported satisfactory knowledge about care of blood loss, air embolism, and muscle cramps. More than half had unsatisfactory level of knowledge about control and preparation of dialysis machine and assessment of patient condition post dialysis.
- Concerning total nurses practice throughout hemodialysis process. The most of them had adequate level of practice related to pre-dialysis, while half of them adequately practice intradialysis, and majority of them deal adequately with hemodialysis complications.
- Nurses aged 30 years or more, graduated from secondary school of nursing, and having 10 years of experience or more had unsatisfactory level of knowledge.
- Nurses having satisfactory level of knowledge have also adequate practices.

Recommendations

- **In the light of the findings of the current study the following recommendations are suggested:-**
- Increase awareness of nurses through conferences about control and preparation of dialysis machine especially cooling dialysis and increased dialysate flow which reduce the rate of intradialytic hypotension and increase the efficiency of hemodialysis treatment.
- In-service educational program for nurses for continuous up-dating and renewal of their knowledge and skills to maintain and improve level of practice.
- Encourage nurses and motivate them to update their knowledge and practices by using the system of gifts and rewards.
- Further researches should be done on a large sample to generalize the results of this study.

References

1. **Ahrens, T.S., Prentice, D., & Kleinpell, R.M. (2007):** Critical care nursing certification: Preparation, review and practice exams, (5th ed.). New York: McGraw-Hill Companies Inc. pp. 572, 578, 579.
2. **Ahsan, M., Gupta, M., Omar, I., Frinak, S., Gendjar, S., Osman-Malik, Y., & Yee, J. (2004):** Prevention of hemodialysis related muscle cramps by intradialytic use of sequential compression devices: A report of four cases. *Hemodial, Int*, Jul 1; 8(3): 283-6.
3. **Atar, I., Konas, D., Acikel, S. (2006):** Frequency of atrial fibrillation and factors related to its development in dialysis patients. *Int J Cardiol*; 106:47-51.
4. **Bakk, C.K. (2010):** Clinical and cost effectiveness of guidelines to prevent intravascular catheter-related infections in patients on hemodialysis. *Nephrol Nurs J*, Nov-Dec; 37(6):601-15; quiz 616.
5. **Bennett, P.N. (2010):** Satellite dialysis nursing: Technology, caring and power. *Journal of Advanced Nursing*; 67(1): 149-157.
6. **Bledose, B.E., & Benner, R.W. (2006):** Critical care paramedic, (1st ed.). New Jersey: Pearson Education Inc. p.756.
7. **Brunner, L.S.H., & Suddarth, D.S. (2008):** Text book of medical surgical of nursing. Nassabe, Z., & Hazrati, M. (translators). Tehran: Salami Publication. Available at: pubmed. Accessed in May 5/2011.
8. **Brenner, B.M. (2000):** The kidney, (6thed.). Philadelphia: Saunders Company. P. 2424.
9. **Butlerly, D.W., & Schwab, S.G. (2000):** Dialysis access infection current opinion in nephrology and hypertension. November, pp.631-35. Available at: pubmed. Accessed in May 5/2011.
10. **Daugirdas, J.T., Blake, P. G., & Ing, T.S. (2007):** Hand book of dialysis, (4thed.). Philadelphia: Lippincott Williams & Wilkins co, pp. 170,177,183,184.
11. **Guyton, A.C., & Hall, J.E. (2006):** Text book of medical physiology, (11th ed.). New York: Elsevier.
12. **Himmelfarb, J. (2005):** Core curriculum in nephrology. hemodialysis complications. National Kidney Foundation, Inc. *American Journal of Kidney Diseases*, June, 45(6): 1122-1131.
13. **Hurst, J.A. (2009):** Venous needle dislodgement (it can happen without warning). *Renal Business Today* [online]. Sep 9 [cited 2009 Dec 29]. Available from Internet: <http://www.renalbusiness.com/articles/venous-needle-dislodgement.htm>. Access on 3/4/2011.
14. **Kallenbach, J., Gutch, C., Stoner, M., & Corea, A. (2005):** Hemodialysis for nurses and dialysis personnel. (7th ed.). Philadelphia: Mosby. P. 336.

15. Keen, M., Breckenridge, D., Frauman, A.C., Hartigan, M.F., Smith, L., Butera, E., Hooper, S.T., Mapes, D., Neff, M., & Fawcett, J. (1998): Nursing assessment and intervention for adult hemodialysis patients: Application of Roy's Adaptation Model. *ANNA Journal*; 25(3): 311. ProQuest Health and Medical Complete. pg. 311.
16. Kowalak, J.P. (2009): *Nursing procedures*, (5th ed.). Philadelphia: Lippincott Williams & Wilkins, p.745.
17. Lewis, S., Heitkemper, M., Dirksen, S., O'Brien, P., & Bucher, L. (2007): *Medical surgical nursing assessment and management of clinical problems*, (7th ed.). Philadelphia: Mosby Inc, an affiliate of Elsevier Inc. pp.1205, 1209, 1222.
18. Levy, J., Brown, E., Daley, CH., & Lawrence, A. (2009): *Oxford hand book of dialysis*. (3rd ed.). New York: Oxford University Press Inc. pp. 140-144.
19. Locatelli, F., Buoncristiani, U., Canaud, B., Kohler, H., Petitclerc, T., & Schally, P. (2005): Dialysis dose and frequency. *Nephrol Dial Transplant*; 20: 285-96.
20. Mayer, B., Kowalak, J., Chohan, N., Duksta, C., Eggenberger, T., Follin, S., Haworth, K., & Robinson, K. (2002): *Illustrated manual of nursing practice*. (3rd ed.). Philadelphia:
21. Monfared, A., Orang Pour, R., & Kohani, M. (2009): Evaluation of hemodialysis adequacy on patients undergoing hemodialysis in Razy hospital of Rasht. *Gilan Med Sci Univ Mag*; 17(65):44- 9.
22. National Kidney Foundation. **K/DOQI**. (2006): *Kidney disease in adults*. *Am J Kidney Dis*, 47(5 suppl 3): S11-145.
23. Nascimento, C.D., Marques, I.R. (2005): Nursing interventions for the most frequent complications during hemodialysis procedure: Literature review. *Rev Bras Enferm*: Nov-Dec; 58(6): 719-22.
24. Riddick, L. Brogdon, B.G. (2010): Fatal air embolism during renal dialysis. *Am J Forensic Med Pathol*; Nov 24.
25. Rosdahl, C.B., & Kowalski, M.T. (2008): *Textbook of basic nursing*. (9th ed.). Philadelphia: Lippincott, pp. 1395-1396.
26. Shaikh, N., Louon, A., & Hanssens, Y. (2010): Fatal dialysis disequilibrium syndrome: Atal of two patients. *J Emerg Trauma Shock*, Jul; 3(3): 300.
27. Sherman, R. A., Daugirdas J. T, & Ing, T S. (2007). Complications during hemodialysis. In Daugirdas, J.T., Blake, P.G., & Ing, T.S. *Handbook of dialysis*. (4th éd.). Sydney: Lippincott Williams & Wilkins. pp. 170-191.
28. Silvestri, L. (2008): *Comprehensive review for the NCLEX-RN EXAMINATION*. (4th ed.). Canada: Saunders Elsevier inc. P 936, 939.
29. Smeltzer, S., & Bare, B. (2004): *Text book of medical surgical nursing*, (10th ed.). Philadelphia: Lippincott Williams & Wilkins, pp. 1286, 1287.
30. Tabrizi E. M., Mehri, N. S. Samiey, S., Einollahi, B. Babaei, Gh.R. (2009): Effect of programmed nursing care in prevention of hemodialysis Complications. *Iranian Journal of Critical Care Nursing*; 2 (2); 55-59.
31. Tatsuya, S., Tsubakihara, Y., Fujii, M., & Imai, E. (2004): Hemodialysis-associated hypotension as an independent risk factor for two-year mortality in hemodialysis patients. *Kidney Int*; 66: 1212–1220.
32. Teta, D. (2008): Intradialytic complications. 40th Annual Meeting of Swiss Society of Nephrology. St. Gallen, December 3-5.
33. Urden, L.D., Stacy, K.M., & Lough, M.E. (2004): *Priorities in critical care nursing*. (4th ed.). Philadelphia: Mosby Elsevier, p. 351.
34. Ward, R.A., & Ronco, C. (2009): Improvements in technology: A path to safer and more effective hemodialysis. *Blood Purif*; 27(1):6-10.
35. WHO. (2004): Joint press releases WHO/ UNICEF for more pregnant women. Getting Antenatal Care. 30 March/ 2004/ Geneva/ New York.
36. Wingard, R. (2009): Reducing early mortality in patient on dialysis: Lessons from the right start program. *Nephrol Nurs J*; 36(2):215-21.
37. Yaaghoobi, M., Mohamadi, E., & Ahmadi, F. (2008): Effects of applying isotonic and isometric exercises on muscles cramp in hemodialysis patients. *Kordestan Sci Univ Mag*; 2(44):53-60.