

## Assessment of Nurses' Practices Regarding Care of Patients Undergoing Hemodialysis

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### **Abstract:**

*Hemodialysis (HD) is the most common dialysis modality which is used for sustaining life of patients with end stage renal disease. However, it is linked to various complications and places unique physiological and psychological stress on HD patients. Therefore, comprehensive and competent nursing care is required to meet complex health needs of HD patients and improve health outcomes. **Objective:** Assess nurses' practices regarding care of patients undergoing hemodialysis. **Setting:** The study was carried out at two hemodialysis units of EL-Mowasat University Hospital and the Medical Research Institute Hospital in Alexandria. **Subjects:** A convenience sample of 50 nurses providing direct care to hemodialysis patients was selected. **Tools:** A single tool was employed for gathering data: Observational checklist regarding nursing care for HD patients. **Results:** Illustrated that 54.0% of nurses had poor overall practices related to the care of HD patients and 38.0% of them had fair practices. While, 8.0% of nurses had good practices. **Conclusions:** Most HD nurses had inadequate practices regarding care of HD patients during all phases of HD procedure and poor practices and adherence level with infection control measures at HD units. **Recommendation:** Continuous assessment of the nurses' practices and performance at HD units is essential to ensure that they comply with HD guidelines, identify and modify any defects in the provided care to improve the quality of nursing care.*

**Keywords:** Hemodialysis, Nurses' Practices, Hemodialysis Nurse, Infection Control Measures.

### **Introduction**

End-stage renal disease (ESRD) is a widespread and serious medical condition that poses a significant threat to life (Morovatdar et al., 2019). It is the most devastating form of chronic kidney disease (CKD), which develops when the glomerular filtration rate (GFR) is less than 15 ml/min/1.73 m<sup>2</sup> (Vaidya et al., 2021). Dialysis and kidney transplantation are the two main treatment options for ESRD (Gebrie, & Ford, 2019). To control health problems, increase the survival rate of patients, and enhance quality of life, maintenance dialysis treatment is necessary (Wang, & Gao, 2022).

End-stage renal disease (ESRD) that necessitates dialysis is becoming more widespread, it was 554,038 in 2018 in the United States (Olczyk et al., 2022). Hemodialysis (HD) is the most commonly used dialysis modality (Fairweather et al., 2020). In Alexandria governorate, Egypt, the prevalence

rate of ESRD on HD reached 710 per million population in 2019 (Megahed et al., 2020). Although, Hemodialysis saves life of patients with ESRD, it is still a technically challenging procedure and forces the patient to experience a distinct physiological and psychological stress (Kairaitis, 2020).

Hemodialysis is associated with various complications including intradialytic hypotension, muscle cramps, headache, arrhythmia, chest pain, itching, fever, and gastrointestinal manifestations like nausea and vomiting (Raja, & Seyoum, 2020). Patients undergoing hemodialysis have complicated healthcare needs because of the physical and psychological impacts of ESRD, its management, and its associated diseases and complications (Rahimi et al., 2019).

Therefore, a comprehensive and competent care is required to prevent complications, promote patients' self-care activities and

adherence to HD treatment, and enhance clinical outcomes (Wen et al., 2022). The patients in the dialysis unit (Ponce et al., 2019). Dialysis nurse observes HD patients for any complications, assists in treating fluid and electrolytes imbalances, evaluates the patients' conditions, and supports them physically and psychologically (Hinkle, & Cheever, 2018). She is also the primary health care provider who is responsible for implementing infection control measures to protect HD patients and staff from infection (Bayoumi et al., 2019).

Compared to other members of the health team, dialysis nurses have more patient interactions and are well positioned to enhance the diagnosis, treatment, and control of clinical problems that are prevalent in HD patients (Hudson-weires et al., 2020). They have a crucial function in preventing hemodialysis-related complications, improving patient adherence to the therapeutic regimen, and reducing the stress caused by long-term dialysis (Arnold et al., 2019).

As a result, this research is conducted to assess the practices of nurses concerning the care of patients undergoing hemodialysis in order to ensure that patients receive proper and high-quality nursing care, resulting in better health outcomes.

**The aim of this study is to:**

Assess nurses' practices concerning the care of HD patients.

**Research question:**

What is the level of nurses' practices regarding care of HD patients?

**Materials and Method:**

**Materials:**

**Design:** A descriptive research design was employed for this study.

**Settings:**

This study was conducted at two hemodialysis units of EL-Mowasat University Hospital and the Medical Research Institute Hospital in Alexandria.

**Subjects:** A convenience sample of 50 nurses (25 nurses from each hospital) was selected based on specific inclusion criteria, including the provision of direct care to HD patients and

nursing staff coordinates the various actions required to provide holistic care to those working in the hemodialysis unit for 6 months or more. The Epi-Info program was utilized to calculate the required sample size.

**Tools:** One tool was employed for gathering data:

**Tool I: Observational checklist regarding nursing care for HD patients.** This tool was developed by (Dawood et al., 2016) for assessing nurses' practices concerning the care of HD patients. It's already translated into the Arabic language. It was adapted by the researchers. It comprised three parts:

**Part I:** Included **socio-demographic attributes of the hemodialysis nurses** such as nurse's name, age, sex, marital status, educational level, the duration of experience in a hemodialysis unit, and attendance of training programs about hemodialysis.

**Part II:** Included **hemodialysis nurses' practices observational checklist:** It was divided into three phases:

**Phase I:** Nurses' practices before hemodialysis procedure. It included 57 items related to pre-hemodialysis assessment, patient preparation, nurse preparation, preparation of equipment, preparation of hemodialysis machine, assessment of vascular access and vascular access cannulation practices.

**Phase II:** Nurses' practices during hemodialysis procedure. It included 138 items related to monitoring patient condition, vascular access and dialysis catheter care, prevention and management of intradialytic complications, maintaining patient safety during hemodialysis session, management of dialysis machine alarms, and medications administration.

**Phase III:** Nurses' practices after hemodialysis procedure. It included 37 items related to nurse preparation, preparation of required equipment, preparation of patient and termination of hemodialysis session, documentation, and care of the HD machine.

**Part III:** Nurses' compliance with infection control measures in the hemodialysis unit. This part included 74 items related to hemodialysis nurses' practices regarding infection control measures such as hand hygiene, donning personal protective equipment (PPE), isolation precautions, waste disposal, handling unclean linens, dealing with spillage of blood and body fluids, prevention of needle stick and sharp injury, and disinfection or sterilization of equipment.

**Scoring System:**

Hemodialysis nurses' practices observational checklist were expressed on a three-point Likert scale spanning from "done correctly" (2 score), "done incorrectly" (1 score), "not done" (0 score). The total score was calculated and converted into a percentage. After that, nurses' practices were categorized into:

- Score below 50% was categorized as a poor level of nursing practices.
- Score equal to, or more than 50% to less than 75% was considered as a fair level of nursing practices.
- Score equal to, or more than 75% was considered as a good level of nursing practices

**Method:**

**The study was accomplished as follows:**

- Formal approval was granted by the Research Ethics Committee, Faculty of Nursing, Alexandria University to conduct the study.
- An official letter from Faculty of Nursing, Alexandria University was submitted to the head of department and hospital director at selected settings.
- Official permission to conduct the study was acquired from the hospital director and the head of the department at the selected settings following explaining the study's objectives.
- One tool was used by the researchers to gather the required data.
- The study tool was adapted by the researchers to assess nurses' practices regarding care of HD patients and the necessary modifications were done.

- The tool was examined by five experts in the field of Medical Surgical Nursing from Faculty of Nursing, Alexandria University to ensure the completeness, clarity, and content validity of the items. The jury's remarks and recommendations were taken into consideration, and the required modifications, corrections, and clarifications of items were implemented as a result.
- The reliability of the tool was tested using Cronbach's alpha. Reliability coefficient was 0.981 which means that the tool was reliable.
- A pilot study involving 10% of the sample (5 nurses) was done to evaluate study tool's clarity, feasibility, and applicability; no changes were made as a result. The pilot sample was not included in the final study subjects.
- Data was collected in period of five months from 13/1/2022 to 15/6/2022.
- Each HD nurse was observed three times throughout the morning and evening shift by using the study tool to assess her practices.

**Statistical analysis:**

- The data were entered into the computer and processed utilizing IBM SPSS software version 20.0 for analysis.
- Quantitative data were presented using numerical values and percentages.
- The normality of the distribution was assessed using the Kolmogorov-Smirnov test.
- Quantitative data were presented utilizing range (minimum and maximum), mean, standard deviation.
- Appropriate tests such as Monte Carlo, Fisher Exact, ANOVA test and Chi square test ( $\chi^2$ ) at  $\leq 0.05$  level of significance were used.
- Significance of the results was evaluated at the 5% level.

**Ethical considerations:**

- Written witness informed consent was obtained from head nurse following explaining the study's objectives.
- Confidentiality of the collected data for each nurse was assured.

## Results:

**Table (1)** presents that the majority (82.0%) of nurses were females and 50.0% of them aged 30 years to less than 40 years. Regarding the marital status, most nurses (66.0%) were married. The table also reveals that, more than half (60.0%) of nurses had diploma of secondary nursing school, and about one quarter (24%) had technical institute of nursing. Concerning duration of experience, 62.0% of nurses had six years or more of work experience at hemodialysis unit. The majority (80.0%) of nurses attended in-service training programs about hemodialysis.

**Table (2)** shows distribution of the studied nurses according to their practices before hemodialysis procedure. 60.0% of nurses had poor practices level in relation to nurse preparation. Regarding pre-hemodialysis assessment, nearly two-thirds (66.0%) of nurses had inadequate level of practices. Most nurses (76.0%) had poor level of practices regarding patient preparation. It was also observed that, 68.0% of the studied nurses had good practice level in relation to preparation of equipment and all nurses had good level of practices related to preparation of the HD machine. 66% of nurses had inadequate practices concerning assessment of vascular access while, more than one quarter (28.0%) of them had good level of practices. As regards vascular access cannulation practices, most nurses (78.0%) had poor level of practices.

**Table (3)** illustrates distribution of the studied nurses according to their practices during hemodialysis procedure. 70.0% of nurses had poor practices level related to monitoring patient condition during HD procedure. Most nurses (72.0%) had inadequate practices in relation to vascular access care (arteriovenous fistula and graft) and 52.0% of them had poor practices as regards dialysis catheter care. An equal percentage (72.0%) of studied nurses had incompetent practices in relation to both prevention and management of intradialytic complications and maintaining

patient safety during hemodialysis session. 46.0% of nurses had inadequate practices and 30.0% had fair practices regarding management of dialysis machine alarms. In relation to medication administration, about two thirds (66.0%) of nurses had poor practices.

**Table (4)** presents percentage distribution of nurses' practices after hemodialysis procedure. Most nurses (78.0%) had inadequate practices regarding nurse preparation and 66.0% of them had poor practices level related to preparation of required equipment. Regarding to preparation of patient and termination of hemodialysis session, 52.0% of nurses had poor practices level. All the studied nurses had good practices regarding documentation of data related to patient care. Most nurses (78.0%) had poor practices concerning care of the HD machine.

**Table (5)** shows nurses' practices and compliance with infection control measures at hemodialysis units. 70.0% of nurses had poor hand hygiene practices and compliance. concerning wearing PPE, 50.0% of the studied nurses had good compliance level. More than two-fifths (44.0%) of nurses had good practices in relation to dealing with spillage of blood and body fluids. In addition, the majority (82.0%) of nurses had good practices regarding waste disposal and 78.0% of them had good practices related to prevention of needle stick and sharp injury. In relation to isolation precautions, 46.0% and 42.0% of nurses had fair and poor practices respectively. 52.0% of nurses had inadequate practices in relation to handling unclean linens. Regarding disinfection or sterilization of equipment, 58.0% of nurses had poor practices.

**Table (6)** shows distribution of the studied nurses according to their overall practices at hemodialysis units. 66.0% of nurses had poor practice level in relation to phase I: nurses' practices before hemodialysis procedure. Concerning phase II: nurses' practices during hemodialysis procedure, the results indicated that, 50.0% and 40.0% of nurses had poor and fair practices level respectively. Furthermore,

more than half (52.0%) of nurses had incompetent practices and 40.0% of them had fair practices level regarding phase III: nurses' practices after hemodialysis procedure. Concerning nurses' compliance with infection control measures in hemodialysis unit, 44.0% of nurses had fair practices level and 42.0% of them had poor practices. In relation to overall nurses' practices at HD units, the table illustrates that, 54.0% of nurses had poor level of practices and 38.0% had fair level of practices, while only 8.0% of nurses had good practices.

**Table (7)** reflects that, there was a statistically significant relationship between nurses' age, marital status, educational level, duration of experience, and nurses' overall practices at hemodialysis units with p value equal 0.010, 0.004, 0.014, 0.037 respectively.

### Discussion

Hemodialysis is a life-sustaining treatment for patients with ESRD (**Bonomini et al., 2022**). However, it may significantly affect the quality of life and health outcomes (**Al-Rubaia et al., 2022**). Comprehensive and competent nursing care is essential to enhance clinical outcomes, adherence to treatment, prevent HD complications, and improve the quality of life for HD patients (**Wen et al., 2022**). The present study was conducted to assess nurses' practices concerning the care of HD patients.

The current study represented that, the majority of the studied nurses were females and half of them were between 30 to 40 years old. In addition, less than two thirds of the studied nurses were married and had diploma of secondary nursing school. These results are consistent with (**Machaly et al., 2020**) who found that, most HD nurses were females and less than half of them had diploma of secondary nursing school.

Regarding dialysis nurses' practices before hemodialysis procedure, the present study findings indicated that, most HD nurses had poor preparation for themselves and poor practice level regarding preparation for HD

patient. It could be due to lack of time, shortage in the number of nurses responsible for patient care, as well as a lack of supervision by senior staff. These findings contradict with (**Ali et al., 2018**) who reported that, the hemodialysis preparation phase had sufficient practices in all items.

Hemodialysis machine could be considered the center of the HD procedure, and no HD could be delivered without its preparation (**Ragab et al., 2021**). All the studied HD nurses had good practices regarding preparation of the HD machine and more than two thirds of them had good practices regarding preparation of equipment. These findings are consistent with (**Saleh, Ali, & Afifi, 2018**) who reported that all nurses were effectively preparing HD machine and equipment.

The results also illustrated that, most HD nurses had incompetent practices concerning assessment of vascular access and its cannulation practices. It could be due to inadequate supervision, lack of accountability, and lack of knowledge and skills. These results agree with (**Salem et al., 2021**) who found the majority of HD nurses did not perform periodic assessment for the vascular access and did not use aseptic technique during cannulation and decannulation procedures. However, it contradicts with (**Alnawafleh et al., 2018**) who reported that the majority of HD nurses correctly performed all essential steps before hemodialysis regarding cannulation practices and accessing a vascular catheter.

In relation to monitoring patient condition during hemodialysis procedure, the results of the present study reflected that, most HD nurses had poor level of practices. It could be due to inadequate nurse-to-patient ratio especially in the afternoon shifts and increased workload. This finding agrees with (**Ibrahim, Ouda, & Ismail, 2019**) and (**Alramadhan, Alsayed, & Alshalawi, 2019**) who reported incompetent nursing care during hemodialysis sessions and all nurses had insufficient practices for patient care during hemodialysis.

Intradialytic complications affect 10% to 70% of hemodialysis patients and its proper management is essential for avoiding patient mortality (**Hamal, & Khadka, 2023**). The present study indicated that, most nurses had inadequate practices concerning management of intradialytic complications which could be due to inadequate knowledge and training about how to prevent and manage hemodialysis complications. This finding disagrees with (**Abdel-Latif et al., 2019**) who found that, nurses were highly knowledgeable about handling hemodialysis complications.

Maintaining patient safety in hemodialysis units is a crucial necessity to minimize the risk of harm, prevent or mitigate errors, and enhance the overall quality of care (**Thomas-Hawkins et al., 2020**). The study represented that; most nurses had incompetent practices related to maintain patient safety and medication administration during HD session. This finding is supported by (**Jiménez et al., 2017**) who reported that, the top five safety issues in HD were patient falls, medication errors, access-related incidents, dialyzer errors, and instances of excessive blood loss.

Regarding nurses' practices after hemodialysis procedure, the present study findings revealed that, most HD nurses had improper preparation for themselves and inadequate preparation of the required equipment for termination of HD procedure. It could be due to heavy workload, fatigue, shortage of supplies and equipment. This finding agrees with (**Mohammed, & Baez, 2023**) who reported that, all items of nurses' practices for post-hemodialysis nursing management were incompletely performed. In addition, the study findings reflected that, the majority of HD nurses had poor practices related to the care of HD machine post-hemodialysis procedure and more than half of them had inadequate practices concerning preparation of patient and termination of hemodialysis session. This finding agrees with (**Bedier et al., 2015**) who reported that, the majority of nurses had inadequate performance related to patient preparation and termination of hemodialysis procedure.

Regarding overall nurses' compliance with infection control measures in the hemodialysis units, it can be noticed that, less than half of nurses had unsatisfactory adherence level. It could be because of inappropriate nurse-patient ratio caused by a rise in the number of hemodialysis patients and decrease in nursing staff, increased workload, lack of available supplies, lack of nurses' knowledge and lack of continuous educational programs to develop their knowledge and skills related to infection control practices. This finding is consistent with (**Elpasiony, Fathallah, & Gabr, 2021**) who reported unsatisfactory level of infection control practices, due to an overcrowded hemodialysis unit, a lack of supplies, and inadequate training. In addition, it is supported by (**Abd El Hafeez et al., 2022**) who found that most health care providers had unsatisfactory knowledge and adherence level to infection control measures at HD units during coronavirus disease pandemic.

Concerning nurses' overall practices at hemodialysis units in the selected hospitals, the results reflected that, more than half of the studied nurses had incompetent practices. It could be due to the nurses do not implement what they have been taught during the study period, but they acquire skills from nurses with previous experience, which leads to poor nursing practices. This result agrees with (**Machaly et al., 2020**) who found that most nurses had unsatisfactory scores for their overall level of practices in hemodialysis (pre, intra, and post). However, it disagrees with (**Sagiron, & Jarelnape, 2022**) who found that the overall practice level of nurses was satisfactory and the majority of them had competent practice with hemodialysis in all its aspects.

Based on the current discussion, it can be inferred that, there are defects in the practices of nurses concerning the care of HD patients. Regular assessment of nurses' practices is essential to identify the weakness and defects of nursing care in order to implement necessary changes aimed at enhancing the quality of nursing care.

**Conclusion:**

Based on the results of this study, it can be concluded that most HD nurses had inadequate practices regarding care of HD patients during all phases of HD procedure and poor practices and adherence level with infection control measures at HD units.

**Recommendations:**

In light of the findings from the current study, the following recommendations should be taken into consideration:

- Hemodialysis nurses should provide high quality of care to prevent any complications during HD procedure and improve health related outcomes for HD patients.
- Periodic training programs and in-service education is recommended to improve hemodialysis nurses’ knowledge, skills, and practices.
- Handouts of clinical practice guidelines on hemodialysis should be provided for HD nurses based on hospital’s protocol to provide adequate guidance and meet the standards of care at HD units.
- Reinforce regular supervision of nurses’ performance at hemodialysis units to ensure that they comply with HD guidelines and to enhance the quality of nursing care.
- Continuous assessment of the nurses’ practices at HD units is essential to identify and modify any defects in the provided care in order to achieve high quality of nursing care.
- Further research should be performed to identify barriers of nurses' compliance with clinical practice guidelines at hemodialysis units.

**Table (1): Distribution of the studied nurses according to their socio-demographic data (n=50)**

| Demographic data   | No. | %    |
|--|-----|------|
| <b>Gender</b>  |     |      |
| Male   | 9   | 18.0 |
| Female   | 41  | 82.0 |
| <b>Age</b>   |     |      |
| 20:<30 years   | 12  | 24.0 |
| 30:<40 years   | 25  | 50.0 |
| 40:<50 years   | 9   | 18.0 |
| 50:<60 years   | 4   | 8.0  |
| <b>Marital status</b>                                      |     |      |
| Single   | 15  | 30.0 |
| Married  | 33  | 66.0 |
| Divorced   | 2   | 4.0  |
| Widow  | 0   | 0.0  |
| <b>Level of education</b>                                  |     |      |
| Master degree  | 1   | 2.0  |
| bachelors’ degree of nursing                               | 7   | 14.0 |
| Technical institute of nursing                             | 12  | 24.0 |
| Diploma of Secondary School                                | 30  | 60.0 |
| <b>Duration of experience</b>                              |     |      |
| < 1 year   | 0   | 0.0  |
| 1:<3 years   | 6   | 12.0 |
| 3:<6 years   | 13  | 26.0 |
| ≥ 6 years  | 31  | 62.0 |
| <b>Attendance of training programs about hemodialysis:</b> |     |      |
| No attendance  | 6   | 12.0 |
| Pre service training programs                              | 4   | 8.0  |
| In- service training programs                              | 40  | 80.0 |

**Table (2): Nurses' practices before hemodialysis procedure (n=50)**

| Phase I: Nurses' practices before hemodialysis procedure:                | First          |      |                |      |                |       | Second         |      |                |      |                |       | Third          |      |                |      |                |       | Average        |      |                |      |                |       |
|--|----------------|------|----------------|------|----------------|-------|----------------|------|----------------|------|----------------|-------|----------------|------|----------------|------|----------------|-------|----------------|------|----------------|------|----------------|-------|
|  | Poor practices |      | Fair practices |      | Good practices |       | Poor practices |      | Fair practices |      | Good practices |       | Poor practices |      | Fair practices |      | Good practices |       | Poor practices |      | Fair practices |      | Good practices |       |
|  | No.            | %    | No.            | %    | No.            | %     | No.            | %    | No.            | %    | No.            | %     | No.            | %    | No.            | %    | No.            | %     | No.            | %    | No.            | %    | No.            | %     |
| <b>A- Nurse preparation</b>  | 34             | 68.0 | 8              | 16.0 | 8              | 16.0  | 31             | 62.0 | 9              | 18.0 | 10             | 20.0  | 24             | 48.0 | 12             | 24.0 | 14             | 28.0  | 30             | 60.0 | 10             | 20.0 | 10             | 20.0  |
| Min. –Max.   | 1.0 – 6.0      |      |                |      |                |       | 1.0 – 6.0      |      |                |      |                |       | 1.0 – 6.0      |      |                |      |                |       | 1.0 – 6.0      |      |                |      |                |       |
| Mean ± SD.   | 2.48 ± 1.40    |      |                |      |                |       | 2.86 ± 1.44    |      |                |      |                |       | 3.32 ± 1.50    |      |                |      |                |       | 2.80 ± 1.43    |      |                |      |                |       |
| <b>B- Pre-hemodialysis assessment</b>                                    | 34             | 68.0 | 6              | 12.0 | 10             | 20.0  | 33             | 66.0 | 1              | 2.0  | 16             | 32.0  | 32             | 64.0 | 1              | 2.0  | 17             | 34.0  | 33             | 66.0 | 3              | 6.0  | 14             | 28.0  |
| Min. –Max.   | 3.0 – 25.0     |      |                |      |                |       | 1.0 – 23.0     |      |                |      |                |       | 3.0 – 24.0     |      |                |      |                |       | 3.0 – 23.0     |      |                |      |                |       |
| Mean ± SD.   | 11.94 ± 6.97   |      |                |      |                |       | 10.56 ± 9.01   |      |                |      |                |       | 12.46 ± 8.25   |      |                |      |                |       | 11.82 ± 7.51   |      |                |      |                |       |
| <b>C- Patient preparation</b>  | 39             | 78.0 | 2              | 4.0  | 9              | 18.0  | 36             | 72.0 | 3              | 6.0  | 11             | 22.0  | 38             | 76.0 | 2              | 4.0  | 10             | 20.0  | 38             | 76.0 | 2              | 4.0  | 10             | 20.0  |
| Min. –Max.   | 1.0 – 6.0      |      |                |      |                |       | 1.0 – 6.0      |      |                |      |                |       | 1.0 – 6.0      |      |                |      |                |       | 1.0 – 6.0      |      |                |      |                |       |
| Mean ± SD.   | 2.28 ± 1.88    |      |                |      |                |       | 2.48 ± 2.13    |      |                |      |                |       | 2.44 ± 1.98    |      |                |      |                |       | 2.12 ± 2.05    |      |                |      |                |       |
| <b>D- Preparation of equipment</b>                                       | 0              | 0.0  | 22             | 44.0 | 28             | 56.0  | 0              | 0.0  | 13             | 26.0 | 37             | 74.0  | 0              | 0.0  | 12             | 24.0 | 38             | 76.0  | 0              | 0.0  | 16             | 32.0 | 34             | 68.0  |
| Min. –Max.   | 1.0 – 2.0      |      |                |      |                |       | 1.0 – 2.0      |      |                |      |                |       | 1.0 – 2.0      |      |                |      |                |       | 1.0 – 2.0      |      |                |      |                |       |
| Mean ± SD.   | 1.56 ± 0.50    |      |                |      |                |       | 1.74 ± 0.44    |      |                |      |                |       | 1.76 ± 0.43    |      |                |      |                |       | 1.68 ± 0.47    |      |                |      |                |       |
| <b>E- Preparation of HD machine</b>                                      | 0              | 0.0  | 0              | 0.0  | 50             | 100.0 | 0              | 0.0  | 0              | 0.0  | 50             | 100.0 | 0              | 0.0  | 0              | 0.0  | 50             | 100.0 | 0              | 0.0  | 0              | 0.0  | 50             | 100.0 |
| Min. –Max.   | 10.0 – 12.0    |      |                |      |                |       | 10.0 – 11.0    |      |                |      |                |       | 10.0 – 11.0    |      |                |      |                |       | 10.0 – 11.0    |      |                |      |                |       |
| Mean ± SD.   | 10.66 ± 0.52   |      |                |      |                |       | 10.50 ± 0.51   |      |                |      |                |       | 10.64 ± 0.48   |      |                |      |                |       | 10.70 ± 0.46   |      |                |      |                |       |
| <b>F- Assessment of vascular access</b>                                  | 36             | 72.0 | 3              | 6.0  | 11             | 22.0  | 33             | 66.0 | 1              | 2.0  | 16             | 32.0  | 31             | 62.0 | 3              | 6.0  | 16             | 32.0  | 33             | 66.0 | 3              | 6.0  | 14             | 28.0  |
| Min. –Max.   | 1.0 – 12.0     |      |                |      |                |       | 1.0 – 12.0     |      |                |      |                |       | 1.0 – 12.0     |      |                |      |                |       | 2.0 – 12.0     |      |                |      |                |       |
| Mean ± SD.   | 5.46 ± 3.90    |      |                |      |                |       | 5.48 ± 4.76    |      |                |      |                |       | 6.20 ± 4.08    |      |                |      |                |       | 6.24 ± 3.90    |      |                |      |                |       |
| <b>G- Vascular access cannulation</b>                                    | 36             | 72.0 | 4              | 8.0  | 10             | 20.0  | 38             | 76.0 | 3              | 6.0  | 9              | 18.0  | 43             | 86.0 | 2              | 4.0  | 5              | 10.0  | 39             | 78.0 | 3              | 6.0  | 8              | 16.0  |
| Min. –Max.   | 14.0 – 37.0    |      |                |      |                |       | 1.0 – 37.0     |      |                |      |                |       | 10.0 – 37.0    |      |                |      |                |       | 8.0 – 37.0     |      |                |      |                |       |
| Mean ± SD.   | 22.10 ± 7.91   |      |                |      |                |       | 21.50 ± 8.94   |      |                |      |                |       | 20.06 ± 6.39   |      |                |      |                |       | 21.36 ± 7.94   |      |                |      |                |       |
| <b>Overall Phase I: Nurses' practices before hemodialysis procedure:</b> | 36             | 72.0 | 4              | 8.0  | 10             | 20.0  | 31             | 62.0 | 10             | 20.0 | 9              | 18.0  | 31             | 62.0 | 14             | 28.0 | 5              | 10.0  | 33             | 66.0 | 9              | 18.0 | 8              | 16.0  |
| <b>Total score</b>   |                |      |                |      |                |       |                |      |                |      |                |       |                |      |                |      |                |       |                |      |                |      |                |       |
| Min. –Max.   | 34.0 – 96.0    |      |                |      |                |       | 19.0 – 95.0    |      |                |      |                |       | 29.0 – 97.0    |      |                |      |                |       | 29.0 – 95.0    |      |                |      |                |       |
| Mean ± SD.   | 56.48 ± 19.74  |      |                |      |                |       | 55.12 ± 22.69  |      |                |      |                |       | 56.88 ± 18.71  |      |                |      |                |       | 56.72 ± 19.78  |      |                |      |                |       |



**Table (3): Nurses' practices during hemodialysis procedure (n=50)**

| Phase II: Nurses' practices during hemodialysis procedure:         | First          |      |                |      |                |      | Second         |      |                |      |                |      | Third          |      |                |      |                |      | Average        |      |                |      |                |      |
|--|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|
|  | Poor practices |      | Fair practices |      | Good practices |      | Poor practices |      | Fair practices |      | Good practices |      | Poor practices |      | Fair practices |      | Good practices |      | Poor practices |      | Fair practices |      | Good practices |      |
|  | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    |
| <b>A- Monitoring patient condition</b>                             | 31             | 62.0 | 9              | 18.0 | 10             | 20.0 | 36             | 72.0 | 5              | 10.0 | 9              | 18.0 | 39             | 78.0 | 5              | 10.0 | 6              | 12.0 | 35             | 70.0 | 7              | 14.0 | 8              | 16.0 |
| Min. –Max.   | 6.0 – 15.0     |      |                |      |                |      | 3.0 – 15.0     |      |                |      |                |      | 6.0 – 15.0     |      |                |      |                |      | 4.0 – 15.0     |      |                |      |                |      |
| Mean ± SD.   | 9.70 ± 3.45    |      |                |      |                |      | 9.06 ± 3.35    |      |                |      |                |      | 8.70 ± 2.82    |      |                |      |                |      | 8.60 ± 3.31    |      |                |      |                |      |
| <b>B- Vascular access care</b>                                     | 35             | 70.0 | 4              | 8.0  | 11             | 22.0 | 35             | 70.0 | 9              | 18.0 | 6              | 12.0 | 37             | 74.0 | 6              | 12.0 | 7              | 14.0 | 36             | 72.0 | 6              | 12.0 | 8              | 16.0 |
| Min. –Max.   | 3.0 – 8.0      |      |                |      |                |      | 4.0 – 9.0      |      |                |      |                |      | 2.0 – 9.0      |      |                |      |                |      | 2.0 – 9.0      |      |                |      |                |      |
| Mean ± SD.   | 4.80 ± 1.94    |      |                |      |                |      | 4.94 ± 1.54    |      |                |      |                |      | 4.68 ± 1.60    |      |                |      |                |      | 4.50 ± 1.99    |      |                |      |                |      |
| <b>C- Dialysis catheter Care</b>                                   | 33             | 66.0 | 7              | 14.0 | 10             | 20.0 | 24             | 48.0 | 8              | 16.0 | 18             | 36.0 | 21             | 42.0 | 11             | 22.0 | 18             | 36.0 | 26             | 52.0 | 9              | 18.0 | 15             | 30.0 |
| Min. –Max.   | 2.0 – 16.0     |      |                |      |                |      | 1.0 – 16.0     |      |                |      |                |      | 2.0 – 15.0     |      |                |      |                |      | 1.0 – 16.0     |      |                |      |                |      |
| Mean ± SD.   | 6.72 ± 4.14    |      |                |      |                |      | 8.84 ± 4.09    |      |                |      |                |      | 8.62 ± 4.43    |      |                |      |                |      | 8.00 ± 4.21    |      |                |      |                |      |
| <b>D- Prevention and management of intradialytic complications</b> | 36             | 72.0 | 4              | 8.0  | 10             | 20.0 | 34             | 68.0 | 6              | 12.0 | 10             | 20.0 | 38             | 76.0 | 3              | 6.0  | 9              | 18.0 | 36             | 72.0 | 4              | 8.0  | 10             | 20.0 |
| Min. –Max.   | 55.0 – 107.0   |      |                |      |                |      | 58.0 – 107.0   |      |                |      |                |      | 45.0 – 107.0   |      |                |      |                |      | 49.0 – 110.0   |      |                |      |                |      |
| Mean ± SD.   | 69.0 ± 21.05   |      |                |      |                |      | 72.34 ± 18.65  |      |                |      |                |      | 67.64 ± 19.13  |      |                |      |                |      | 69.46 ± 19.60  |      |                |      |                |      |
| <b>E- Maintaining patient safety during hemodialysis session</b>   | 38             | 76.0 | 5              | 10.0 | 7              | 14.0 | 33             | 66.0 | 4              | 8.0  | 13             | 26.0 | 36             | 72.0 | 7              | 14.0 | 7              | 14.0 | 36             | 72.0 | 5              | 10.0 | 9              | 18.0 |
| Min. –Max.   | 16.0 – 32.0    |      |                |      |                |      | 16.0 – 31.0    |      |                |      |                |      | 16.0 – 31.0    |      |                |      |                |      | 15.0 – 32.0    |      |                |      |                |      |
| Mean ± SD.   | 18.62 ± 4.88   |      |                |      |                |      | 20.08 ± 5.88   |      |                |      |                |      | 18.42 ± 4.50   |      |                |      |                |      | 18.90 ± 5.12   |      |                |      |                |      |
| <b>F- Management of dialysis machine alarms</b>                    | 15             | 30.0 | 23             | 46.0 | 12             | 24.0 | 25             | 50.0 | 14             | 28.0 | 11             | 22.0 | 28             | 56.0 | 10             | 20.0 | 12             | 24.0 | 23             | 46.0 | 15             | 30.0 | 12             | 24.0 |
| Min. –Max.   | 26.0 – 48.0    |      |                |      |                |      | 19.0 – 51.0    |      |                |      |                |      | 12.0 – 48.0    |      |                |      |                |      | 19.0 – 52.0    |      |                |      |                |      |
| Mean ± SD.   | 33.70 ± 8.43   |      |                |      |                |      | 30.98 ± 9.67   |      |                |      |                |      | 30.94 ± 10.40  |      |                |      |                |      | 31.98 ± 10.31  |      |                |      |                |      |
| <b>G- Medication administration</b>                                | 34             | 68.0 | 4              | 8.0  | 12             | 24.0 | 35             | 70.0 | 5              | 10.0 | 10             | 20.0 | 30             | 60.0 | 7              | 14.0 | 13             | 26.0 | 33             | 66.0 | 5              | 10.0 | 12             | 24.0 |
| Min. –Max.   | 4.0 – 13.0     |      |                |      |                |      | 4.0 – 14.0     |      |                |      |                |      | 3.0 – 13.0     |      |                |      |                |      | 5.0 – 13.0     |      |                |      |                |      |
| Mean ± SD.   | 7.80 ± 3.20    |      |                |      |                |      | 6.98 ± 3.75    |      |                |      |                |      | 7.80 ± 3.48    |      |                |      |                |      | 7.78 ± 3.14    |      |                |      |                |      |
| <b>Overall nurses' practices during HD procedure</b>               | 25             | 50.0 | 20             | 40.0 | 5              | 10.0 | 23             | 46.0 | 22             | 44.0 | 5              | 10.0 | 26             | 52.0 | 19             | 38.0 | 5              | 10.0 | 25             | 50.0 | 20             | 40.0 | 5              | 10.0 |
| <b>Total score</b>   | 117.0 – 232.0  |      |                |      |                |      | 116.0 – 236.0  |      |                |      |                |      | 110.0 – 235.0  |      |                |      |                |      | 114.0 – 233.0  |      |                |      |                |      |
| Min. –Max.   | 150.34 ± 35.13 |      |                |      |                |      | 153.22 ± 35.27 |      |                |      |                |      | 146.80 ± 35.06 |      |                |      |                |      | 149.22 ± 32.68 |      |                |      |                |      |
| Mean ± SD.   |                |      |                |      |                |      |                |      |                |      |                |      |                |      |                |      |                |      |                |      |                |      |                |      |

**Table (4): Nurses' practices after hemodialysis procedure (n=50)**

| Phase III: Nurses' practices after hemodialysis procedure                | First          |      |                |      |                |       | Second         |      |                |      |                |       | Third          |      |                |      |                |       | Average        |      |                |      |                |      |
|--|----------------|------|----------------|------|----------------|-------|----------------|------|----------------|------|----------------|-------|----------------|------|----------------|------|----------------|-------|----------------|------|----------------|------|----------------|------|
|  | Poor practices |      | Fair practices |      | Good practices |       | Poor practices |      | Fair practices |      | Good practices |       | Poor practices |      | Fair practices |      | Good practices |       | Poor practices |      | Fair practices |      | Good practices |      |
|  | No.            | %    | No.            | %    | No.            | %     | No.            | %    | No.            | %    | No.            | %     | No.            | %    | No.            | %    | No.            | %     | No.            | %    | No.            | %    | No.            | %    |
| <b>A- Nurses` preparation</b>  | 39             | 78.0 | 0              | 0.0  | 11             | 22.0  | 44             | 88.0 | 2              | 4.0  | 4              | 8.0   | 35             | 70.0 | 5              | 10.0 | 10             | 20.0  | 39             | 78.0 | 3              | 6.0  | 8              | 16.0 |
| Min. –Max.   | 1.0 – 4.0      |      |                |      |                |       | 1.0 – 4.0      |      |                |      |                |       | 1.0 – 4.0      |      |                |      |                |       | 1.0 – 4.0      |      |                |      |                |      |
| Mean ± SD.   | 1.66 ± 1.26    |      |                |      |                |       | 1.26 ± 0.78    |      |                |      |                |       | 1.68 ± 1.17    |      |                |      |                |       | 1.50 ± 1.04    |      |                |      |                |      |
| <b>B- Preparation of required equipment</b>                              | 33             | 66.0 | 6              | 12.0 | 11             | 22.0  | 34             | 68.0 | 5              | 10.0 | 11             | 22.0  | 32             | 64.0 | 12             | 24.0 | 6              | 12.0  | 33             | 66.0 | 8              | 16.0 | 9              | 18.0 |
| Min. –Max.   | 3.0 – 12.0     |      |                |      |                |       | 1.0 – 12.0     |      |                |      |                |       | 4.0 – 12.0     |      |                |      |                |       | 2.0 – 12.0     |      |                |      |                |      |
| Mean ± SD.   | 6.42 ± 3.32    |      |                |      |                |       | 5.66 ± 2.68    |      |                |      |                |       | 6.30 ± 2.60    |      |                |      |                |       | 6.08 ± 2.94    |      |                |      |                |      |
| <b>C- Preparation of patient and termination of hemodialysis session</b> | 29             | 58.0 | 8              | 16.0 | 13             | 26.0  | 17             | 34.0 | 15             | 30.0 | 18             | 36.0  | 32             | 64.0 | 12             | 24.0 | 6              | 12.0  | 26             | 52.0 | 12             | 24.0 | 12             | 24.0 |
| Min. –Max.   | 9.0 – 29.0     |      |                |      |                |       | 11.0 – 30.0    |      |                |      |                |       | 7.0 – 25.0     |      |                |      |                |       | 8.0 – 28.0     |      |                |      |                |      |
| Mean ± SD.   | 16.44 ± 7.45   |      |                |      |                |       | 19.68 ± 6.13   |      |                |      |                |       | 14.02 ± 5.53   |      |                |      |                |       | 16.10 ± 6.42   |      |                |      |                |      |
| <b>D-Documentation</b>   | 0              | 0.0  | 0              | 0.0  | 50             | 100.0 | 0              | 0.0  | 0              | 0.0  | 50             | 100.0 | 0              | 0.0  | 0              | 0.0  | 50             | 100.0 | 0              | 0.0  | 0              | 0.0  | 50             | 100  |
| Min. –Max.   | 10.0 – 12.0    |      |                |      |                |       | 9.0 – 12.0     |      |                |      |                |       | 10.0 – 12.0    |      |                |      |                |       | 10.0 – 12.0    |      |                |      |                |      |
| Mean ± SD.   | 11.02 ± 1.0    |      |                |      |                |       | 10.88 ± 1.24   |      |                |      |                |       | 11.26 ± 0.96   |      |                |      |                |       | 11.12 ± 0.96   |      |                |      |                |      |
| <b>E- Care of the machine</b>  | 39             | 78.0 | 5              | 10.0 | 6              | 12.0  | 38             | 76.0 | 4              | 8.0  | 8              | 16.0  | 40             | 80.0 | 5              | 10.0 | 5              | 10.0  | 39             | 78.0 | 5              | 10.0 | 6              | 12.0 |
| Min. –Max.   | 4.0 – 23.0     |      |                |      |                |       | 1.0 – 21.0     |      |                |      |                |       | 3.0 – 21.0     |      |                |      |                |       | 1.0 – 23.0     |      |                |      |                |      |
| Mean ± SD.   | 10.96 ± 5.18   |      |                |      |                |       | 8.24 ± 6.73    |      |                |      |                |       | 10.40 ± 4.55   |      |                |      |                |       | 10.44 ± 5.39   |      |                |      |                |      |
| <b>Overall nurses' practices after HD procedure</b>                      | 27             | 54.0 | 19             | 38.0 | 4              | 8.0   | 24             | 48.0 | 21             | 42.0 | 5              | 10.0  | 28             | 56.0 | 20             | 40.0 | 2              | 4.0   | 26             | 52.0 | 20             | 40.0 | 4              | 8.0  |
| <b>Total score</b>   |                |      |                |      |                |       |                |      |                |      |                |       |                |      |                |      |                |       |                |      |                |      |                |      |
| Min. –Max.   | 32.0 – 69.0    |      |                |      |                |       | 28.0 – 67.0    |      |                |      |                |       | 30.0 – 63.0    |      |                |      |                |       | 29.0 – 63.0    |      |                |      |                |      |
| Mean ± SD.   | 46.50 ± 11.32  |      |                |      |                |       | 45.72 ± 11.65  |      |                |      |                |       | 43.72 ± 9.59   |      |                |      |                |       | 45.24 ± 10.28  |      |                |      |                |      |

**Table (5): Nurses' compliance with infection control measures at hemodialysis units (n=50)**

| Phase IV: Nurses' compliance with infection control measures at the hemodialysis unit      | First          |      |                |      |                |      | Second         |      |                |      |                |      | Third          |      |                |      |                |      | Average        |      |                |      |                |      |
|--|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|
|  | Poor practices |      | Fair practices |      | Good practices |      | Poor practices |      | Fair practices |      | Good practices |      | Poor practices |      | Fair practices |      | Good practices |      | Poor practices |      | Fair practices |      | Good practices |      |
|  | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    |
| <b>A- Hand hygiene</b>   | 36             | 72.0 | 4              | 8.0  | 10             | 20.0 | 34             | 68.0 | 5              | 10.0 | 11             | 22.0 | 33             | 66.0 | 7              | 14.0 | 10             | 20.0 | 35             | 70.0 | 5              | 10.0 | 10             | 20.0 |
| Mean ± SD.   | 9.18 ± 5.77    |      |                |      |                |      | 9.54 ± 5.65    |      |                |      |                |      | 9.80 ± 5.43    |      |                |      |                |      | 9.48 ± 5.71    |      |                |      |                |      |
| <b>B- Wearing PPE</b>  | 21             | 42.0 | 4              | 8.0  | 25             | 50.0 | 20             | 40.0 | 6              | 12.0 | 24             | 48.0 | 19             | 38.0 | 6              | 12.0 | 25             | 50.0 | 20             | 40.0 | 5              | 10.0 | 25             | 50.0 |
| Mean ± SD.   | 21.60 ± 12.65  |      |                |      |                |      | 21.58 ± 11.88  |      |                |      |                |      | 24.02 ± 10.28  |      |                |      |                |      | 22.64 ± 11.55  |      |                |      |                |      |
| <b>C- Dealing with spillage of blood and body fluids</b>                                   | 10             | 20.0 | 12             | 24.0 | 28             | 56.0 | 15             | 30.0 | 16             | 32.0 | 19             | 38.0 | 18             | 36.0 | 13             | 26.0 | 19             | 38.0 | 14             | 28.0 | 14             | 28.0 | 22             | 44.0 |
| Mean ± SD.   | 6.70 ± 1.79    |      |                |      |                |      | 6.10 ± 1.90    |      |                |      |                |      | 5.84 ± 2.13    |      |                |      |                |      | 6.26 ± 2.03    |      |                |      |                |      |
| <b>D- Waste disposal</b>   | 6              | 12.0 | 8              | 16.0 | 36             | 72.0 | 2              | 4.0  | 1              | 2.0  | 47             | 94.0 | 2              | 4.0  | 9              | 18.0 | 39             | 78.0 | 3              | 6.0  | 6              | 12.0 | 41             | 82.0 |
| Mean ± SD.   | 7.60 ± 2.05    |      |                |      |                |      | 8.38 ± 1.12    |      |                |      |                |      | 8.10 ± 1.79    |      |                |      |                |      | 8.14 ± 1.74    |      |                |      |                |      |
| <b>E- Prevention of needle stick and sharp injury</b>                                      | 4              | 8.0  | 4              | 8.0  | 42             | 84.0 | 6              | 12.0 | 8              | 16.0 | 36             | 72.0 | 5              | 10.0 | 6              | 12.0 | 39             | 78.0 | 5              | 10.0 | 6              | 12.0 | 39             | 78.0 |
| Mean ± SD.   | 9.84 ± 1.94    |      |                |      |                |      | 9.50 ± 2.36    |      |                |      |                |      | 9.90 ± 2.31    |      |                |      |                |      | 9.66 ± 2.39    |      |                |      |                |      |
| <b>F- Isolation precautions</b>  | 19             | 38.0 | 24             | 48.0 | 7              | 14.0 | 12             | 24.0 | 29             | 58.0 | 9              | 18.0 | 28             | 56.0 | 15             | 30.0 | 7              | 14.0 | 21             | 42.0 | 23             | 46.0 | 6              | 12.0 |
| Mean ± SD.   | 17.12 ± 5.17   |      |                |      |                |      | 18.12 ± 4.75   |      |                |      |                |      | 15.28 ± 6.42   |      |                |      |                |      | 17.0 ± 4.65    |      |                |      |                |      |
| <b>G- Handling unclean linens</b>  | 25             | 50.0 | 17             | 34.0 | 8              | 16.0 | 22             | 44.0 | 17             | 34.0 | 11             | 22.0 | 29             | 58.0 | 12             | 24.0 | 9              | 18.0 | 26             | 52.0 | 15             | 30.0 | 9              | 18.0 |
| Mean ± SD.   | 4.18 ± 2.96    |      |                |      |                |      | 4.42 ± 2.86    |      |                |      |                |      | 4.04 ± 2.95    |      |                |      |                |      | 4.56 ± 2.56    |      |                |      |                |      |
| <b>H- Disinfection or sterilization of equipment</b>                                       | 28             | 56.0 | 12             | 24.0 | 10             | 20.0 | 24             | 48.0 | 15             | 30.0 | 11             | 22.0 | 35             | 70.0 | 8              | 16.0 | 7              | 14.0 | 29             | 58.0 | 12             | 24.0 | 9              | 18.0 |
| Mean ± SD.   | 5.50 ± 2.77    |      |                |      |                |      | 5.64 ± 2.80    |      |                |      |                |      | 4.56 ± 2.89    |      |                |      |                |      | 4.88 ± 3.12    |      |                |      |                |      |
| <b>Overall nurses' compliance with infection control measures in the hemodialysis unit</b> | 24             | 48.0 | 20             | 40.0 | 6              | 12.0 | 20             | 40.0 | 22             | 44.0 | 8              | 16.0 | 20             | 40.0 | 24             | 48.0 | 6              | 12.0 | 21             | 42.0 | 22             | 44.0 | 7              | 14.0 |
| <b>Total score</b><br>Mean ± SD.   | 81.72 ± 25.22  |      |                |      |                |      | 83.28 ± 25.83  |      |                |      |                |      | 81.54 ± 22.86  |      |                |      |                |      | 82.62 ± 21.04  |      |                |      |                |      |

**Table (6): Percent distribution of the studied nurses according to their total practices at hemodialysis units (n=50).**

| Total nurses' practices at hemodialysis units                       | First           |      |                |      |                |      | Second         |      |                |      |                |      | Third          |      |                |      |                |      | Average        |      |                |      |                |      |
|---|-----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|----------------|------|
|   | Poor practices  |      | Fair practices |      | Good practices |      | Poor practices |      | Fair practices |      | Good practices |      | Poor practices |      | Fair practices |      | Good practices |      | Poor practices |      | Fair practices |      | Good practices |      |
|   | No.             | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    | No.            | %    |
| <b>Phase I: Nurses' practices before hemodialysis procedure:</b>    | 36              | 72.0 | 4              | 8.0  | 10             | 20.0 | 31             | 62.0 | 10             | 20.0 | 9              | 18.0 | 31             | 62.0 | 14             | 28.0 | 5              | 10.0 | 33             | 66.0 | 9              | 18.0 | 8              | 16.0 |
| Mean ± SD.  | 56.48 ± 19.74   |      |                |      |                |      | 55.12 ± 22.69  |      |                |      |                |      | 56.88 ± 18.71  |      |                |      |                |      | 56.72 ± 19.78  |      |                |      |                |      |
| <b>Phase II: Nurses' practices during hemodialysis procedure</b>    | 25              | 50.0 | 20             | 40.0 | 5              | 10.0 | 23             | 46.0 | 22             | 44.0 | 5              | 10.0 | 26             | 52.0 | 19             | 38.0 | 5              | 10.0 | 25             | 50.0 | 20             | 40.0 | 5              | 10.0 |
| Mean ± SD.  | 150.34 ± 35.13  |      |                |      |                |      | 153.22 ± 35.27 |      |                |      |                |      | 146.80 ± 35.06 |      |                |      |                |      | 149.22 ± 32.68 |      |                |      |                |      |
| <b>Phase III: Nurses' practices after hemodialysis procedure</b>    | 27              | 54.0 | 19             | 38.0 | 4              | 8.0  | 24             | 48.0 | 21             | 42.0 | 5              | 10.0 | 28             | 56.0 | 20             | 40.0 | 2              | 4.0  | 26             | 52.0 | 20             | 40.0 | 4              | 8.0  |
| Mean ± SD.  | 46.50 ± 11.32   |      |                |      |                |      | 45.72 ± 11.65  |      |                |      |                |      | 43.72 ± 9.59   |      |                |      |                |      | 45.24 ± 10.28  |      |                |      |                |      |
| <b>Phase IV: Nurses' compliance with infection control measures</b> | 24              | 48.0 | 20             | 40.0 | 6              | 12.0 | 20             | 40.0 | 22             | 44.0 | 8              | 16.0 | 20             | 40.0 | 24             | 48.0 | 6              | 12.0 | 21             | 42.0 | 22             | 44.0 | 7              | 14.0 |
| Mean ± SD.  | 81.72 ± 25.22   |      |                |      |                |      | 83.28 ± 25.83  |      |                |      |                |      | 81.54 ± 22.86  |      |                |      |                |      | 82.62 ± 21.04  |      |                |      |                |      |
| <b>Overall Nurses' practices at hemodialysis units</b>              | 27              | 54.0 | 17             | 34.0 | 6              | 12.0 | 28             | 56.0 | 16             | 32.0 | 6              | 12.0 | 27             | 54.0 | 18             | 36.0 | 5              | 10.0 | 27             | 54.0 | 19             | 38.0 | 4              | 8.0  |
| Mean ± SD.  | 454.72 ± 103.58 |      |                |      |                |      | 337.34 ± 80.51 |      |                |      |                |      | 328.94 ± 74.18 |      |                |      |                |      | 333.34 ± 62.82 |      |                |      |                |      |

**Table (7): Relation between nurses' overall practices at hemodialysis units and their socio-demographic data (n=50)**

| Nurses' socio- demographic data                            | Overall nurses' practices (Average) |      |                        |      |                       |       | $\chi^2$ | MC <sub>p</sub> |
|--|-------------------------------------|------|------------------------|------|-----------------------|-------|----------|-----------------|
|  | Poor practices (n =27)              |      | Fair practices (n =19) |      | Good practices (n =4) |       |          |                 |
|  | No.                                 | %    | No.                    | %    | No.                   | %     |          |                 |
| <b>Gender</b>  |                                     |      |                        |      |                       |       |          |                 |
| Male   | 3                                   | 11.1 | 4                      | 21.1 | 2                     | 50.0  | 3.649    | 0.139           |
| Female   | 24                                  | 88.9 | 15                     | 78.9 | 2                     | 50.0  |          |                 |
| <b>Age</b>   |                                     |      |                        |      |                       |       |          |                 |
| 20:<30 years   | 10                                  | 37.0 | 2                      | 10.5 | 0                     | 0.0   | 14.204*  | 0.010*          |
| 30:<40 years   | 14                                  | 51.9 | 9                      | 47.4 | 2                     | 50.0  |          |                 |
| 40:<50 years   | 2                                   | 7.4  | 7                      | 36.8 | 0                     | 0.0   |          |                 |
| 50:<50 years   | 1                                   | 3.7  | 1                      | 5.3  | 2                     | 50.0  |          |                 |
| <b>Marital status</b>                                      |                                     |      |                        |      |                       |       |          |                 |
| Single   | 13                                  | 48.1 | 1                      | 5.3  | 1                     | 25.0  | 12.207*  | 0.004*          |
| Married  | 14                                  | 51.9 | 16                     | 84.2 | 3                     | 75.0  |          |                 |
| Divorced   | 0                                   | 0.0  | 2                      | 10.5 | 0                     | 0.0   |          |                 |
| Widow  | 0                                   | 0.0  | 0                      | 0.0  | 0                     | 0.0   |          |                 |
| <b>Level of education</b>                                  |                                     |      |                        |      |                       |       |          |                 |
| Master degree  | 1                                   | 3.7  | 0                      | 0.0  | 0                     | 0.0   | 13.546*  | 0.014*          |
| Bachelor of nursing  | 3                                   | 11.1 | 1                      | 5.3  | 3                     | 75.0  |          |                 |
| Technical institute of nursing                             | 4                                   | 14.8 | 8                      | 42.1 | 0                     | 0.0   |          |                 |
| Diploma of Secondary School                                | 19                                  | 70.4 | 10                     | 52.6 | 1                     | 25.0  |          |                 |
| <b>Duration of experience</b>                              |                                     |      |                        |      |                       |       |          |                 |
| < 1 year   | 0                                   | 0.0  | 0                      | 0.0  | 0                     | 0.0   | 8.715*   | 0.037*          |
| 1:<3 years   | 6                                   | 22.2 | 0                      | 0.0  | 0                     | 0.0   |          |                 |
| 3:<6 years   | 9                                   | 33.3 | 4                      | 21.1 | 0                     | 0.0   |          |                 |
| ≥6 years   | 12                                  | 44.4 | 15                     | 78.9 | 4                     | 100.0 |          |                 |
| <b>Attendance of training programs about hemodialysis:</b> |                                     |      |                        |      |                       |       |          |                 |
| No attendance  | 4                                   | 14.8 | 2                      | 10.5 | 0                     | 0.0   | 1.303    | 0.865           |
| Pre service training programs                              | 3                                   | 11.1 | 1                      | 5.3  | 0                     | 0.0   |          |                 |
| In- service training programs                              | 20                                  | 74.1 | 16                     | 84.2 | 4                     | 100.0 |          |                 |

$\chi^2$ : Chi square test    MC: Monte Carlo    p: p value for comparing between overall nurses' practices and demographic data    \*: Statistically significant at  $p \leq 0.05$

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