

Assessment of Nurses Performance regarding Arteriovenous Fistula Cannulation and Suggested Guidelines for Prevention of its Failure

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Abstract

Background: Dialysis center nurses play a central role in preventing arteriovenous fistula complications. **Aim of study:** Was to assess nurses' performance regarding arteriovenous fistula cannulation. **Research design:** A descriptive research design was utilized to conduct this study. **Setting:** This study was conducted at dialysis unit in Benha University Hospital. **Sample:** All available 50 nurses working at previous mentioned setting. **Tools of data collection:** Two tools were used. **I:** A structured questionnaire to assess knowledge. **II:** Observational checklist to assess practice regarding arteriovenous fistula cannulation. **Results:** Less than two thirds of nurses had poor knowledge regarding arteriovenous fistula, while less than one-third of them had good knowledge. Less than three-quarters of the studied nurses had unsatisfactory level of total practices about arteriovenous fistula cannulation. **Conclusion:** There was a positive statically significant correlation between nurses' knowledge and practices regarding arteriovenous fistula cannulation **Recommendations:** In-service training programs should frequently be established in the unit for continuous up dating and regeneration of nurse's knowledge and skills to maintain and improve level of awareness and practice.

Key words: Arteriovenous fistula, Failure, Guidelines, Nursing performance, Prevention.

Introduction

Renal failure means loss of kidney function leading to accumulation of creatinine, urea and other nitrogenous wastes and fall of glomerular filtration rate to below 80 ml/min. Kidney failure also called end-stage renal disease, it's the last stage of chronic kidney disease that means kidneys have stopped working well enough to survive and it's caused by other health problems that have done permanent damage to kidneys little by little over time such as diabetes, hypertension and other problems include Genetic diseases, autoimmune diseases, urinary tract problems and nephritic syndrome (Elaine, 2019).

Hemodialysis is usually performed at a dialysis center or hospital or at home. Two needles are inserted into patient's arm and each is attached to a flexible plastic tube that connects to a dialyzer (a filter that cleans blood) which takes the blood in through one tube. It allows extra fluids and wastes to pass from the blood into a cleansing patient fluid. The filtered blood is then returned to the body through a second tube. Most of people have about three sessions of treatments a week, each of which takes about three to four hours (Henedy, 2019). Arteriovenous fistula is an abnormal connection or passage way between an artery and vein. This connection is made by a vascular surgeon.

Assessment of Nurses Performance regarding Arteriovenous Fistula Cannulation and Suggested Guidelines for Prevention of its Failur

Vascular surgeons usually place an AV fistula in the forearm or upper arm. An AV fistula causes extra pressure and extra blood to flow into the vein, making it grow large and strong. The larger vein provides easy, reliable access to blood vessels, without this kind of access; regular hemodialysis sessions would not be possible. Untreated veins cannot withstand repeated needle insertions, because they would collapse (**Julie et al., 2019**).

Cannulation techniques need a skillful nurse to avoid vascular access complications, which affect vascular access survival. However, establish restricted cannulation techniques guidelines using it as guidance for nursing practice needling at the dialysis unit to reduce vascular access complications, identify the factors that lead to vascular access complications and develop holistic guidelines for cannulation techniques in center (**Bayoumi, 2020**).

Significance of the study:

Worldwide, the total number of individuals with renal replacement therapy exceeds 850 million, a figure that is double the estimated number of people with diabetes worldwide (**Ferreira et al., 2020**).

No previous studies related to nurses' role for maintaining survival of arteriovenous fistula are conducted in Benha university hospital. Because of the importance of the AVF, this study will be conducted to assess nurses' performance regarding AVF cannulation and to suggest guidelines that would help nurses to prevent AVF failure.

Aims of the study:

This study aimed to assess nurses' performance regarding arteriovenous fistula

cannulation and prepare suggested guidelines for prevention of its failure at Benha university hospital.

Research questions:

1. What is the nurses' knowledge level about principles of arteriovenous fistula cannulation?
2. What is the nurses' practice regarding arteriovenous fistula cannulation?
3. What is the relation between nurses' knowledge and their practice regarding to arteriovenous fistula cannulation?

Subjects and Methods:

Research Design:

A descriptive research design was utilized to conduct the aim of the study.

Setting:

The study was conducted at dialysis unit in Benha University Hospital. It locates in the second floor of the medical building. The capacity of the hemodialysis unit is 35 beds divided into two rooms; one for positive virus C patients with 13 beds and the other is for negative virus C patients. It contains 5rooms divided into one room for catheter insertion, two rooms for supplies store, one room for nurses' supervisor and one room for headmaster of the unit.

Tool of data collection: -

Two tools were used to conduct the study

Tool I: Nurses' structured questionnaire:

This tool was developed by the investigator after review of literature as (**Mousa, et al., 2018**), (**Jeffery et al., 2019**) and (**Elain et al., 2020**) to assess nurses' knowledge about principles of arteriovenous fistula cannulation and it is presented in simple

Arabic structure items related to different aspects. It is consisted of two parts: -

Part I: Demographic characteristics of nurses:

This part was aimed to identify nurses' demographic characteristics consisted of their age, sex, level of education, marital status, years of experience and training courses related to arteriovenous fistula cannulation.

Part II: - Nurses' knowledge Assessment:

This part is divided into knowledge related to renal failure and knowledge related to arteriovenous fistula cannulation and prevention of its failure. This part is designed into multiple choice questions. It contains (50) questions which is divided as:

1- Nurses' knowledge about renal failure which include:

- Nurses' knowledge regarding anatomy and function of urinary system.(3 questions).
- Nurses knowledge regarding renal failure (5 questions).
- Nurses' knowledge regarding hemodialysis (24 questions).

2- Nurses' knowledge about arteriovenous fistula cannulation which include:

- Nurses' knowledge regarding to arteriovenous fistula (9 questions).
- Nurses' knowledge regarding to complications of arteriovenous fistula (6 questions).
- Nurses' knowledge regarding to prevention of arteriovenous fistula failure (3 questions).

Scoring system for knowledge:

All knowledge variables were weighted

according to items included in each question. The answers of the questions were classified into 3 categories. The answer would have score (2) for complete correct answer, score (1) for incomplete correct answer and score (0) for wrong answer.

The score of total knowledge was 100 which classified as the following:

- Good: (≥ 75 score %)
- Average: (50 – 74 score %)
- Poor: (< 50 score %)

Tool II: An Observational checklist:

It is designed by the researcher after reviewing related literature to assess nurses' practice regarding to arteriovenous fistula cannulation. It includes four parts:

- 1- Nurses' skills for arteriovenous fistula immediately before dialysis session were three steps.
- 2- Nurses' skills (Lori, 2016), (Roca et al., 2016) and (Elain et al., 2020) arteriovenous fistula at starting hemodialysis session were twenty step.
- 3- Nurses' skills for arteriovenous fistula during dialysis session were four steps.
- 4- Nurses' skills for arteriovenous fistula at finishing hemodialysis session were seven steps.

Scoring system:

The score of practice ranged from (0) to (1), each statement scored as following: (1) if done and (0) if not done.

The total score of practice of 34 steps was classified into two levels:

- Satisfactory level: ≥ 80 %
- Unsatisfactory level: < 80 %

Nurses guidelines:

It was developed by the investigator after reviewing the related literature and according to nurses' needs regarding to arteriovenous fistula

Assessment of Nurses Performance regarding Arteriovenous Fistula Cannulation and Suggested Guidelines for Prevention of its Failur

cannulation. It includes two main parts (theoretical and practical). The theoretical part includes: Part1; Information about anatomy and function of urinary system and information about renal failure as definition, causes, types, signs and symptoms and treatment. Part2; Information about hemodialysis as definition, time to start dialysis , advantages, complications and health education to be given to the patient related to dialysis. Part3; Information about arteriovenous fistula as definition, indications, advantages, health education to the patient about how to deal with the arteriovenous fistula. The practical part includes: care to be given to the patient undergoing dialysis and nursing care to the arteriovenous fistula immediately before, at the beginning, during and at the end of dialysis session.

Content validity:

Content validity of the suggested tools was done by a jury of five experts in Medical Surgical Nursing in Faculty of Nursing Benha University, one professor, two assistant professor and one lecturer, to determine whether the included items are clear and suitable to achieve the aim of the study.

Reliability of tools:

Reliability of the tools was done by using Cronbach's Alpha coefficient test which revealed that each of the two tools consisted of relatively homogenous items as indicated by high reliability for each tool. The internal consistency of the tools was as the following:

Tools	Alpha Cronbach's
Structured interviewing questionnaire	0.89
Observational checklist	0.92

Ethical consideration:

Oral consent was obtained from the

studied nurses in order to participate in the study. The aim of the study was explained to all nurses and they were reassured that all information will be confidential and it will be used only for their benefit and for the research purpose. The studied nurses also informed that they are allowed to choose to participate or not in the study and they have the right to withdraw from the study at any time without any reasons giving. The research tool will not cause any harm for participants. Permission to carry out the study from responsible authorities in the faculty of nursing at Benha University and hospital administration personnel.

Pilot study:

A pilot study was conducted on 5 nurses (10%) from the total number of the studied nurses and they were included in the study. The pilot study aimed to test the feasibility, clarity, and applicability of the tools also to determine the time needed for filling the structured questionnaire.

Field work:

Before conducting the study, an exploratory visit was done to the dialysis unit at Benha University Hospital in order to estimate total number of nurses and suitable time for collecting data. An interview will be conducted with head nurses of the previous mentioned settings to inform them about the purpose of the study, and request their assistance to facilitate the work. Interviewing with nurses before starting data collection was conducted to establish a good relationship with them, explain the aim and nature of the study was done for them. Data was collected at morning and afternoon shifts (long day shift) three days/week. Assessment of the nurses' practical skills through observational checklist (tool II) was done by the investigator

at time of preparation, starting, during and at the end of dialysis session. After that, Assessment of the nurses' knowledge through structured interviewing questionnaire (Tool I) was given to each nurse to fill it and time required for completion of the questionnaire was 15 minutes. Nursing guidelines was developed according to their needs.

Statistical analysis:

Statistical analysis was done by using statistical package for social sciences (SPSS) version 22. Data were collected, revised, coded, organized, tabulated, and analyzed using frequencies, number, percentage, mean scores, and standard deviation. Data were presented in the form of tables and figures. Quantitative data was presented by mean (X) and standard deviation (SD). Qualitative data was presented in the form of frequency distribution tables, number and percent. It was analyzed by Chi-square test (X^2) to detect the relation between the variables of the study (P- value).

Statistical significance was considered as follows:

- P-value > 0.05 Not significant
- P-value < 0.05 Significant
- P-value < 0.001 Highly significant

Results:

Table (1): Shows that 46.0% of the studied sample was in the age group of 20-30 years with a mean age of 33.92 ± 8.79 years In relation to marital status, 86.0% were married. Also, 94.0% of them were female. Regarding educational level, 58.0% had studied at technical nursing institute. In addition; regarding occupation, 78.0% of them were bedside nurse. Moreover, 54.0% of them had 5-10 years of experience in hemodialysis unit. Finally, 92.0% of them didn't take any training course about how to deal with the arteriovenous fistula.

Figure (1): Shows that 62.0% of the studied nurses had poor knowledge regarding arteriovenous fistula cannulation and prevention of its failure, while 30.0% of them had good knowledge.

Figure (2): Illustrates that 70.0% had unsatisfactory level of total practices about arteriovenous fistula cannulation and prevention of its failure, while 30.0% of them had satisfactory level.

Table (2): Clarifies that, there was a highly statistically significant positive correlation between total knowledge and total practices scores regarding arteriovenous fistula cannulation and prevention of its failure ($p \leq 0.001$).

Assessment of Nurses Performance regarding Arteriovenous Fistula Cannulation and Suggested Guidelines for Prevention of its Failur

Table 1: Numbers and percentage of the studied nurses according to their demographic characteristics (N = 50).

Socio-demographic characteristics	No	%
Age in (years)		
20-30	23	46.0
31-40	12	24.0
>40	15	30.0
Mean ± SD = 33.92 3± 8.79		
Marital Status		
Single	5	10.0
Married	43	86.0
Divorced	1	2.0
Widow	1	2.0
Gender:		
Female	47	94.0
Male	3	6.0
Qualification:		
Secondary Nursing Diploma	12	24.0
Technical Nursing Institute	29	58.0
Bachelor of Nursing	7	14.0
Postgraduate studies	2	4.0
Occupation:		
Bedside nurse	39	78.0
Nursing supervisor	11	22.0
Years of experience in hemodialysis unit:		
< 5 years	11	22.0
5 - 10 years	27	54.0
> 10 years	12	24.0
Training courses on how to deal with the arteriovenous fistula:		
Yes	4	8.0
No	46	92.0

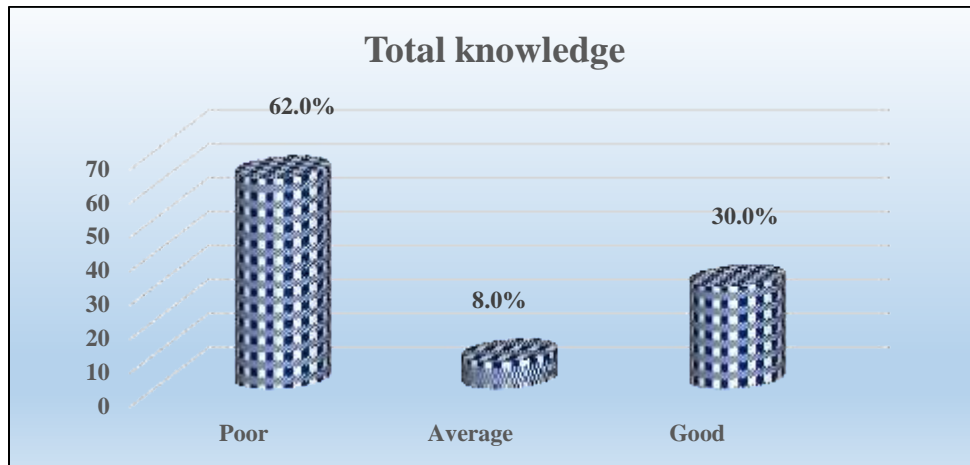


Fig. 1: Percentage distribution of studied nurses' total knowledge score regarding arteriovenous fistula cannulation and prevention of its failure (N = 50).

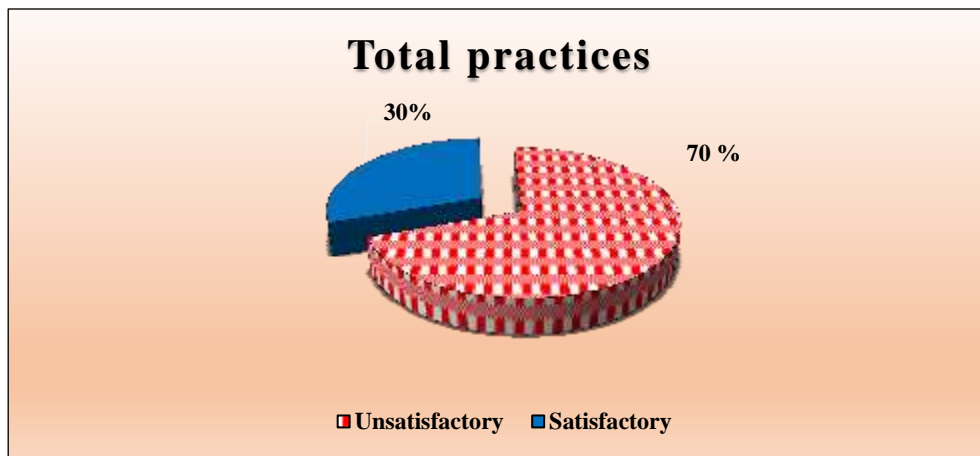


Fig. 2: Percentage distribution of the studied nurses according to their total reported practices (about arteriovenous fistula cannulation and prevention of its failure (N = 50).

Table 2: Correlation coefficient between studied nurses' total knowledge and practices regarding arteriovenous fistula cannulation and prevention of its failure (N = 50).

Variables	Total practices	
	r	P value
Total knowledge	.570	≤ 0.001**

Assessment of Nurses Performance regarding Arteriovenous Fistula Cannulation and Suggested Guidelines for Prevention of its Failur

Discussion

Arteriovenous fistula is the universally recommended permanent hemodialysis access for patients receiving hemodialysis. The maintenance of AVF patency remains a challenge for current medicine. Several advances in medical technologies have been made to help maintain AVF patency. These include ultrasound assessment for operation, better timing for the first cannulation and advances in cannulation techniques. Even with these approaches detailed in guidelines for creation, AVF failure rates are still far from optimal (**Chang et al., 2016**).

Regarding to demographic characteristics of the studied nurses, it was cleared that less than half of the studied sample was in the age group of 20-30 years with a mean age of 33.92 3 ± 8.79 years In relation to marital status, the majority of them were married. Also, most of them were female. Regarding educational level, more than half of them had studied at technical nursing institute. In addition; regarding occupation, more than three-quarters of them were bedside nurse. Moreover; more than half of them had 5-10 years of experience in hemodialysis unit. Finally, most of them didn't take any training course about how to deal with the arteriovenous fistula.

This result agreed with the study result of **Mahmoud et al. (2014)** who conducted study of "Assessment of Self-Care Practice of Patients on Maintenance Hemodialysis at Cairo University Hospitals" and found that the majority of studied sample were female and higher than one third of them aged between 25-30 years old.

This finding disagreed with **Ali et al., (2019)** who conducted a study of "Assessment of Knowledge, Attitudes and Practices of

Nurses Regard Infection Control Program in El-Hawwary Renal Dialysis Centre in Benghazi City, Libya" and reported that more than three quarters of studied nurses had qualification of diploma.

Concerning nurses' general knowledge regarding AVF, the current study illustrated that, less than two-thirds of the studied nurses had poor knowledge regarding arteriovenous fistula cannulation and prevention of its failure, while less than one-third of them had good knowledge. The investigator opinion of this result may be because of lack of up-dating their knowledge, training courses, time pressure due to overlapping duties.

Despite to this a study of "Effectiveness of An Educational Program on Knowledge and Practices Regarding Care of arteriovenous fistula among Dialysis Nurses" which was conducted by **Abdo et al. (2020)**, showed that nearly two-thirds of studied nurses had satisfactory knowledge regarding arteriovenous fistula cannulation.

As regard to distribution of the studied nurses according to their total practices about arteriovenous fistula cannulation and prevention of its failure, the current study showed that less than three-quarters of the studied nurses had unsatisfactory level of total practices about arteriovenous fistula cannulation and prevention of its failure, while only less than one-third of them had satisfactory level. This finding agreed with **Mohamed et al. (2019)** who conducted a study of "Nursing Competency with Vascular Access Care among Hemodialysis Patients in Arab World: A Narrative Review" and found that vascular care provided by nurses to Hemodialysis patients in Arab world should be

improved through continuous training programs, and that the available training programs are not sufficient. All this would affect quality of care among Arab HD patients

Also, **Mohamed & Yassein, (2017)** reported that their study has highlighted that more than two thirds of nurses had poor practices regarding cannulation as well as decannulation of the vascular access. This finding also agreed with **Parisotto et al. (2017)** who conducted a study of “Elements of dialysis nursing practice associated with successful cannulation” and recommended for conducting continuous education for training of dialysis nurses and to minimize vascular access complications and prolong its life span.

From the investigator point of view, the outcome of current study confirms the importance of training and education of healthcare workers in improving their knowledge and practices regarding AVF care and maintenance in addition to reduction of its complication for avoidance of its failure.

As regard to Correlation coefficient between studied nurses' total knowledge and practices regarding arteriovenous fistula cannulation and prevention of its failure, our study clarified that there was a highly statistically significant positive correlation between total knowledge total practices scores regarding arteriovenous fistula cannulation and prevention of its failure ($p \leq 0.001$). This may reflect the importance of improving knowledge level of nurses to obtain high level of practice to avoid failure of the fistula
This finding was supported with the study of **Ahmed et al. (2016)** who found that there was high positive relation between nurses' knowledge and their practice regarding care provided to arteriovenous fistula.

Conclusion:

There was poor knowledge regarding arteriovenous fistula and in the studied nurses, also there was unsatisfactory level of practice regarding cannulation. There was a highly statistically significant positive correlation between total knowledge total practices scores regarding arteriovenous fistula cannulation and prevention of its failure.

Recommendation

- In-service training programs should frequently be accompanied in the unit for continuous updating and regeneration of nurse's knowledge and skills to maintain and improve level of awareness and practice.
- Distribute cannulation techniques posters everywhere at the dialysis unit at each center in Egypt.
- Further researches should be done on a large sample focusing on nurses' knowledge and its reflection on their practice.

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Assessment of Nurses Performance regarding Arteriovenous Fistula Cannulation and Suggested Guidelines for Prevention of its Failur

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تقييم أداء الممرضات فيما يتعلق بإدخال الوصلة الشريانية الوريدية والمبادئ التوجيهية المقترحة للوقاية من فشلها

بدريه إبراهيم الدالي- صباح سعيد محمد – ايمان صبحي عمران

تعتبر الوصلة الشريانية الوريدية هي الممر الاساسي والدائم لعملية الغسيل الكلوي لدي مرضي الذين يتعرضون للغسيل الكلوي الوريدي الدموي نظرا لاهمية هذا الممر يعتبر محافظة عليا من اهم اجزاء الطب الحديث لابد من التدريب المستمر لكل اعضاء الفريق الطبي من اطباء وتمريض عن كيفية التعامل مع الوصلة الشريانية الوريدية . لذلك هدفت هذه الدراسة الي تقييم أداء الممرضات فيما يتعلق بإدخال الوصلة الشريانية الوريدية والمبادئ التوجيهية المقترحة للوقاية من فشلها. وقد أجريت الدراسة في بوحدة غسيل الكلى بمستشفى جامعة بنها على جميع الممرضات البالغ عددها ٥٠ العاملات في الأماكن المذكورة سابقاً. حيث خلصت الدراسة بوجود علاقة إيجابية ذات دلالة إحصائية بين معلومات الممرضات وممارساتهم فيما يتعلق بإدخال الوصلة الشريانية الوريدية. كما اوصت الدراسة بضرورة تنفيذ برامج تعيمية للممرضات وذلك لتحسين مستوى معلوماتهم وممارساتهم تجاه ادخال الوصلة الشريانية الوريدية وتجنب المضاعفات الناتجة.