Factors Affecting Arteriovenous Fistula Survival among Hemodialysis Patients

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Abstract

Background First step in chronic dialysis is establishing a suitable dialysis access. Arteriovenous fistula (AVF) has been known as the gold standard for hemodialysis; and many factors affect its survival time. **Aim of the study**: was to assess factors affecting AVF survival among the hemodialysis patients. **Subjects:** A convenient sample of all available nurses (30 nurses) working in hemodialysis unit at Assuit University Hospital and a convenient sample of adult patients with AVF in the previously mentioned unit were selected. **Research Design:** A descriptive exploratory research design was used in this study. It is a type of research that describes a population, situation, or phenomenon that is being studied. This is mainly because it is important to have a proper understanding of what a research problem is about before investigating why it exists in the first place. **Tools:** three tools used in the current study: self-administration questionnaire, observational checklist, and patients assessment sheet. **Results:** 40% of studied nurses had unsatisfactory level of knowledge about AVF care, 56.7% of them had unsatisfactory level of practice about AVF care and 48.7% of studied patients had unsatisfactory level about self – care behavior. **Conclusion:** The result of this study concluded that many factors affecting AVF survival time, whereas more than half of the studied nurses had unsatisfactory level of knowledge and practice regarding AVF care. Also, around half of the studied patients had satisfactory level of self care behavior Moreover, from the studied nurses' point of view, most of them reported that other ; nurses related factors had high effect, followed by environmental related factors and patients related factors **Recommendation:** Providing continous in-service training and regular educational programs regarding AVF care for the studied nurses in hemodialysis unit.

Key words: Arteriovenous fistula survival, Hemodialysis patients, factors affecting.

Introduction

Hemodialysis requires a well-functioning vascular access (VA) that allows sufficient blood flow to achieve adequate clearance and blood dialysis. The VA offers excellent way for bacteria to invade blood stream of patients undergoing HD. One of the major problems and causes of failure in HD was represented by the lack of good VA *(Canaud et al., 2019).*

The AVF is a subcutaneous anastomosis of an artery with an adjacent vein, usually in the non-dominant limb of the patient, to limit the consequences of any functional disability. The recommended location, initially, is the more distal, saving you the most proximal vessels, because if there is a failure of AVF, will be able to rebuild it in a more proximal location *(Mozaffar et al., 2013).*

The VA dysfunction is one of the most important causes of morbidity and mortality in HD patients, contributing to up to one third of hospitalizations and accounting for a significant amount of the health care costs of these patients *(Gameiro & Ibeas, 2020; Yap et al., 2021).* Primary AVF dysfunction in HD patients is associated with gender, ageing, PLT counting number, hemoglobin level, and retention time of temporary catheter *(Wen et al., 2019).*

Arteriovenous fistula survival means the time span between creation of primary fistula

and its first failure *(Puškar et al., 2002)*. Early AVF failure is one that either never develops adequately to support dialysis or fails within the first 3 months of its use *(Asif et al., 2006).* Late failure is defined as failure episodes beyond 3 months after using fistula *(Yen et al., 2018).*

Many factors affecting survival of AVF are underlying diseases, surgical technique and skilled staff. Patients related factors include age, gender, number of fistulization, location (right/left and brachial/radial), the time patients started dialysis after installing fistula, dialysis session per week, underlying disease, fistula infection, which recorded by history taking and physical examination *(Sabet et al., 2019).*

Nurses related factors affecting AVF survival include good cannulation technique, examination of the fistula and implementing proven infection control practices, using aspetic technique, appropriate cannulation methods, the timing of fistula cannulation and early evaluation of immature fistula are all factors that may prevent morbidity and prolonge its survival *(Vale et al., 2015).*

Hemodialysis is the therapy used most often among patients with ESRD. In Egypt, according to statistical record at Assuit University Hospital, the total number of patients admitted to this hospital in the year 2017/2018 was 40812 of them 3436 patients underwent HD, which representing (8.4%). The AVF is the method of choice for the establishment of HD vascular access in patients with ESRD. A well function VA is a prerequisite for successful HD treatment. Therefor, VA sites need special care to increase its maintenance.

The AVF complications are leading cause of hospitalization and morbidity among HD patients. The survival of AVF is based on multi-factors, include surgical technique, patients condition and nurses practices. Because lack of studies in the field of VA care for HD patients, so this study was conducted to assess AVF survival time and the affecting factors. Hopefully, the nurses take there factors into consideration in the care of AVF to raise its survival rate by enhancing the long term patency of fistula and minimizing its short and long term associated complications among HD patients.

Subjects and Methods

The aim of the study was to assess factors affecting AVF survival among the hemodialysis patients through the following:
1. Assess survival time of arteriovenous fistula among the hemodialysis patients.
2. Assess factors affecting survival of arteriovenous fistula among the hemodialysis patients.

Research questions:-

The current study answered the following questions:

1. What are arteriovenous fistula survival time among the hemodialysis patients?

2. What are the factors affecting arteriovenous fistula survival among the hemodialysis patients?

The subject and methods of the current study were designed under the following main four designs:
　　I. Technical Design
　　II. Operational Design
　　III. Administrative Design
　　IV. Statistical Design

I. **Technical Design**
It included research design, study settings, subjects and tools of data collection.

Research Design
A descriptive exploratory research design was used in this study. It is a type of research that describes a population, situation, or phenomenon that is being studied. This is mainly because it is important to have a proper understanding of what a research problem is about before investigating why it exists in the first place *(Fain, 2017).*

Study Setting:
This study was conducted in Hemodialysis Unit at Assuit University Hospital, this unit contained five sectors; one sector contained 12 beds, three sectors, each one contained 10 beds (one of them for hepatitis C virus cases, other one sector for hepatitis B virus cases and one sector for negative cases), and the last sector for urgent cases contained 24 beds. So, the total number of unit beds was 66

beds. Each sectors had 2 nurses responsible of caring of patient on dialysis machine. There were 100 industrial dialysis machines in the dialysis unit and located on the ground floor, the total number of nursing staff who work in this unit was (30 nurses).

Subjects:

The study subjects were included:

- A convenient sample of all available nurses (no=30) working in hemodialysis unit at Assuit University Hospital was recruited.

- A convenient sample of adult patients (no= 230) in both gender with arteriovenous fistula for hemodialysis in the previously mentioned setting was selected.

Sample size (for patient)

The study subject was included a representative sample of total number of patients 3436 who were on hemodialysis during the year 2018 in hemodialysis the unit at Assuit university hospital. So, the sample size who was participated in this study was (230) patients. The sample size was calculated by adjusting the power of the test to 80% and the confidence interval to 95% with margin of error accepted adjusted to 5% using the following equation:

$$n = \frac{N \times p(1-p)}{\left[\left[N - 1 \times \left(d^2 \div z^2\right)\right] + p(1-p)\right]}$$

Nxp (1-p)	= (160* (0.12* (1-0.12)))/
N-1	= (160-1)*
d^2/z^2	=0.0025 / 3.8416+
p (1-p)	=0.12* (1-0.12)
N	=80

N=   Community size

z=   Class standard corresponding to the level of significance equal to 0.95 and 1.96

d=   The error rate is equal to 0.05

p=   Ratio provides a neutral property = 0.12

Tools of data collection:

Three tools were used to collect the data and fulfilled the study aim.

Tool (I): Nurses' self administered questionnaire: (Appendix I):

It was developed by the researcher after reviewing related literatures *(Jenkins et al., 2018 & Yang et al., 2019).* It was written in an Arabic language. It included the following parts:

Part 1:- Nurses' demographic characteristics: This part was used to assess the nurses' demographic data which involved six questions included age, gender, marital status level of education, years of experiences, training course.

Part 2:- Nurses' knowledge assessment: This part was concerned with assessing the nurses' knowledge regarding the care of AVF among the HD patients. This part consisted of 49 closed ended questions in form of multiple choice questions (MCQs) This part was consisted of four sections :

Section I: Concerned with nurses' basic knowledge about AVF. It included definition of AVF, indication and contraindication, advantages and disadvantages of AVF (14 questions).

Section II: Focused on nurse's knowledge regarding complications of AVF. It included signs and symptom of AVF infection, stenosis and thrombosis (7 questions).

Section III: Concerned with of nurse's knowledge regarding the care for AVF. It included frequency measurement of blood pressure, caring for fistula bleeding and instruction before starting session (16 questions).

Section IV: Concerned with nurse's knowledge regarding health education about AVF. It included instruction before, during and after session of HD related AVF (12 questions).

❖ **Scoring system of nurses' knowledge** :

The total number of questions was 49, checked with a model key answer and accordingly the nurses' knowledge was categorized into either correct or incorrect, the correct answer took one grade and the wrong answer took zero. So, the total score was summed and converted into a percent, it was classified into 2 categories:

- **Satisfactory** level of knowledge if score ≥ 80% (≥40 grades)

- **Unsatisfactory** level of knowledge if score < 80% (<40 grades).

Part 3:   Other factors affecting arteriovenous fistula; these factors were assessed from the nurses' point of view, it included nurses' related factors (12 statements). Patients related factors (14 statements). Environmental related factors (14 statements). There were 40 statements, the response for each statement was one grade for yes and zero for no. So total score classified as the following:

- ≥ 80% = >32 grades of the stated factors indicated high effect.

- < 80% = < 32 grades of the stated factors indicated low effect.

Tool   (II):   Nurses'   practice observational   checklist   regarding   AVF: (Appendix II):

This tool was developed by researcher in English language after reviewing related literatures *(Dawood et al., 2016 & Tordoir et al., 2018).* It was used to assess nurses practice regarding the care of AVF among the HD patients, it included:

Section I: Pre-cannulation technique of AVF, it included (15 steps).

Section II: Cannulation technique of AVF insertion, it included (20 steps).

Section III: Post\ AVF decannulation, it included (10 steps).

Section IV: The care of AVF, it included (10 steps).

Section V: - Patients education, it included (13 steps).

❖ **Scoring system:**
The   total   steps   for   observational checklist were 68, the response for each step was done correctly took one grade, while not-done or done in-correctly took zero. So, the total score was summed and converted into a percent, it was classified into 2 categories:

- Satisfactory level of practice if score ≥ 80% (≥ 55grades)

- Unsatisfactory level of practice if score < 80% (<55 grades).

Tool   (III):   Hemodialysis   patients assessment: (Appendix III):

It included three parts:

Part 1:- Demographic characteristics and medical data:- This part used to assess patient's demographic data and medical data which involved 19 questions included age, gender, level of education, experiences, marital status, occupation, residence, cost of treatment, diagnosis, duration of hemodialysis, weight before session, weight after session, height, medical history and family history.

Part II: AVF assessment:- This part developed by researcher based on literature review *(Tordoir, 2015 & Vancouver, 2015).* It consisted of two sections:

Section I: **Examination of fistul**a: it consisted of (14items), to assess fistula location, number of fistulisation, survival time and criteria of its survival among the HD patients.

Section II: Examination of fistula for any complications: it consisted of eight complications related to AVF and manifestation for each one, the response option was either yes \took one score or no\ took zero score.

Part III: Patients' self-care behavior assessment tool: it was adopted from *Sousa et al., (2015)*. It was translated into Arabic language and back translation was done. It was used to assess HD patients self-care reported practice regarding the care of AVF and involved 29   statements.   The   response   for   healthy behavior took one grade and zero for unhealthy behavior.

❖ **Scoring system:**
The total statement of the tool was 29, checked   with   a   model   key   answer   for identifying positive (healthy behavior) and negative (unhealthy behavior). the response for each positive statement took one grade and zero for negative statement. So, the total score was summed and converted into a percent. It was classified into 2 categories:

- **Satisfactory** self-care behavior if score ≥ 80% (≥23 grades)

- **Unsatisfactory** self-care behavior if score < 80% (<23 grades).

II) Operational design:

The operational design included; preparatory phase, validity and reliability of the developed tools, pilot study and field work.

Preparatory Phase

It included reviewing of related literature, and theoretical knowledge of various aspects of the study using books, articles, internet periodicals and magazines to develop tools for data collection.

Ethical considerations

The ethical research considerations in the study include the following:

1- The research approval of the current study was obtained from scientific research Ethical Committee in Faculty of Nursing at Ain Shams University before starting the study.
2- The researcher clarified the objective and the aim of the study to the subjects who included in the study.
3- The researcher assured maintaining anonymity and confidentiality of subjects data.
4- Subjects were informed that they allowed to choose to participate or not in the study and that, they had the right to withdraw from the study at any time without giving any reasons.
5- Ethics, values, culture and beliefs of subjects were respected.
6- An approval was obtained from the directors of Hemodialysis Unit Assuit University Hospital.

Tools Validity and reliability

Testing validity referred to how well a scientific test actually measured what it intended to measure of the proposed tools by using face and content validity. Face validity aimed at inspecting the items to determine whether the tools measured what supposed to measure. Content validity was conducted to determine whether the content of the tools covered the aim of the study. Validity tested by a jury of five experts one professor and four

assistant professors from Medical Surgical Nursing Department at Faculty of Nursing, Ain Shams University. The experts reviewed the tools for clarity, relevance, comprehensiveness, simplicity and applicability, minor modification was done.

Testing reliability: It was referred to the extent to which the same answers can be obtained by using the same used tools more than one time. It was done for proposed tools and reported statistically by Cronbach's Alpha test reliability analysis. For measuring of internal consistency of the used.

Table (1): Reliability of study tools.

Reliability of study tools	Cronbach's alpha
I- Total nurses' knowledge	0.831
• Basic knowledge about AVF	0.873
• Knowledge about complication AVF	0.786
• Knowledge about the care of AVF	0.835
• Knowledge regarding health education	0.904
Total other factors affecting	0.757
II- Total nurses' Nurses' observational checklist	0.877
• Pre- cannulation practice	0.869
• Cannulation practice	0.874
• Post\ decanulation practice	0.955
• Care	0,798
• Patients education	0.889
III- Total HD patients assessment	0.823
• Patient self-care behavior	0.840
• AVF assessment	0.873

Pilot Study:

The pilot study was carried out on 3 nurses and 23 patients, those represented 10% of the subjects included in this study in the HD unit at Assuit University Hospital in order to test the applicability and the clarity of the constructed tools. Also, the pilot served to estimate the time needed for each subject to fulfill data collection tools. According to the results of the pilot, no modification or omissions of items were performed, so the nurses and patients included in the pilot study were sharing in the study sample.

Fieldwork:

An approval was obtained from the selected HD unit at Assuit University Hospital. A letter was issued to them from the Faculty of Nursing, Ain shams University for explaining the aim of the study in order to obtain their permission and cooperation. Data were collected during six months, from the beginning of June 2019 to the end of November 2019.

The researcher was visited the study setting 3days / week at morning shift (8.0am-2.0pm) and afternoon shift (2.0pm-8.0pm) to collect data. After that, explained the purpose of the study after introducing herself. Then, the observational checklist for assessing nurses' practice regarding AVF care was filled by the investigator while the studied nurses giving the care for HD patients. The investigator observed (2-3 nurses per day) worked at the previously mentiond setting. The questionnaire distributed to nursing staff to be filled by their in each shift took 20- 25 minutes.

The investigator met (3-4 patients per day) who connected with dialysis machine at the previously mentioned setting and explained the purpose of the study after introducing herself. The data collection related to AVF assessment and patients' self care behavior filled by the investigator, it included demographic data took 5 minutes, examination of fistula took 15 minutes and patient self care behavior took 5 minutes.

III. Administrative Design
A letter was issued from the Faculty of Nursing at Ain Shams University to the Medical Director of HD unit at Assuit University Hospital at which the study conducted. The researcher met the hospital director to explain the purpose of the study and requesting the permission for data collection.

IV. Statistical Analysis
Data collected from the studied sample was revised, coded and entered using Personal Computer (PC). Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 22. Data were presented using descriptive statistics in the form of frequencies, percentages. Chi-square test (X^2) was used for comparisons between qualitative variables. Spearman correlation measures the strength and direction of association between two ranked variables. Significance of the results: Highly significant at p-value < 0.001, statistically significant was considered at p-value < 0.05, non-significant at p-value ≥ 0.05.

Results:

Table (1): shows that, the mean age of studied nurses was 33.30 ± 11.58 years, 60% of them were females. Regarding marital status, 60%of the nurses were married and regarding educational level, it was found that 56.7% of them were graduated from nursing school. Also, 50.0% of the studied nurses had more than 10 years of experience in hemodialysis unit, 63.3%of them had previous training courses regarding nursing care for HD patients and 47.4% of them took two training courses.

Table (2): illustrats that, 50% of the studied nurses had unsatisfactory knowledge about AVF, 76.7% of them had unsatisfactory knowledge about complications of AVF and 46.7% of them had unsatisfactory knowledge about health education while 80.0% of them had satisfactory knowledge about the care of AVF.

Figure (1): shows that 63.3% of the studied nurses viewed that many reported factors had high effect on AVF survival. While 36.7% of them viewed that those factors had low effect.

Table (3) illustrated that, the studied nurses had unsatisfactory level of practice regarding pre-cannulation of AVF, post-cannulation of AVF and about the care of AVF; 56.7%, 63.3% and70.0% respectively.

Figure (2): shows that, 51.3% of the studied patients had total satisfactory level of self care behavior regarding AVF care. While 48.7% of them had unsatisfactory level.

Table (4) reveals that, there was highlly statistically significant relation between survival time AVF (years) and nurses total level of knowledge and practice among the studied patients at p. value <0.001. While, there was statistically significant relation between survival time of AVF and patients' self-care behavior at p value < 0.05.

Table (5): shows that, there were highly statistically significant correlation between AVF survival time and nurses total level of knowledge, practice and patients' self-care behavior at p. value <0.001. While, there was no statistically significant correlation between AVF survival time and other affecting factors; nurses, patients environmental related factors at p value > 0.05.

Part I: Demographic characteristics of the studied nurses.

Table (1): Frequency and percentage distribution of the studied nurses' demographic characteristics (n=30).

Items	No. (30)	%
Age: (years)		
18-< 30	13	43.3
30-<45	11	36.7
45-60	6	20.0
Mean ± SD	33.30 ± 11.58	
Range	19.0-55.0	
Gender:		
Male	12	40.0
Female	18	60.0
Marital status:		
Married	18	60.0
Single	8	26.6
Widowed	2	6.7
Divorced	2	6.7
Educational level:		
Diploma	17	56.7
Technical institute	13	43.3
Years of experience in hemodialysis unit:		
< 5	7	23.3
5-<10	8	26.7
≥ 10	15	50.0
Attending training courses about nursing care:		
Yes	19	63.3
No	11	36.7
No. of courses: (n= 19)		
One	8	42.1
Two	9	47.4
Three	2	10.5

Table (2): Frequency and percentage distribution of the studied nurses' total level of knowledge regarding AVF (n=30).

Items	Satisfactory		Unsatisfactory	
	No	%	No	%
Basic knowledge about AVF	15	50.0%	15	50.0%
Knowledge about complications	7	23.3%	23	76.7%
Knowledge about the care of AVF	24	80.0%	6	20.0%
Knowledge about health education	16	53.3%	14	46.7%
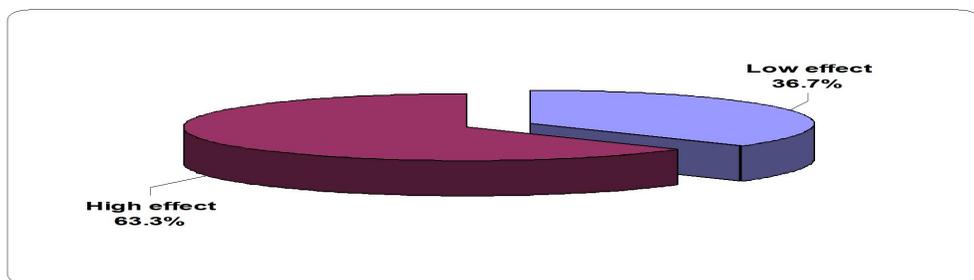
Figure (1): Percentage distribution of total level of other factors affecting on AVF survival from the studied nurses point of view (n=30).

Table (3): Frequency and percentage distribution of the studied nurses' practice level regarding AVF care among the studied patients (n=30).

Items	Satisfactory		Unsatisfactory	
	No	%	No	%
Pre-cannulation	13	43.3%	17	56.7%
Cannulation	24	80.0%	6	20.0%
Post-cannulation	11	36.7%	19	63.3%
Care of AVF	9	30.0%	21	70.0%
Health education	17	56.7%	13	43.3%
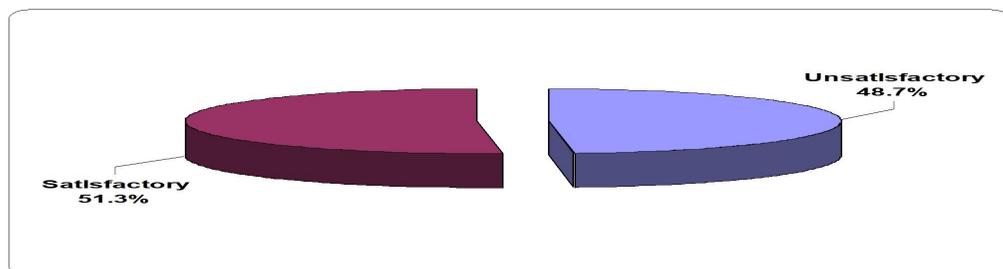
Figure (2): Percentage distribution of total level of the patients self-care behavior regarding AVF care among the studied patients (n=230).

Table (4): Relation between the studied patients' AVF survival time (years) and the nurses total level of knowledge, practice and the patients' self-care behavior

	survival time of AVF (years)						
	< 5 (n= 133)		5-10 (n= 73)		≥ 10 (n= 24)		X^2	P-value
	No.	%	No.	%	No.	%		
Knowledge:								
Unsatisfactory	98	66.2	43	29.1	7	4.7	18.95	0.000**
Satisfactory	35	42.7	30	36.6	17	20.7		
Practice:								
Unsatisfactory	104	65.4	51	32.1	4	2.5	36.10	0.000**
Satisfactory	29	40.8	22	31.0	20	28.2		
Self-care behavior								
Unsatisfactory	74	66.1	30	26.8	8	7.1	6.52	0.038*
Satisfactory	59	50.0	43	36.4	16	13.6		

*significant p- value <0.05.**high significant p- value < 0.001.

Table (5): Correlation between the studied patients' AVF survival time and the nurses total level of knowledge, practice, the patients self-care behavior, and other affecting factors**.**

	survival of AVF (years)	
	r-value	P-value
Knowledge	0.547	0.001**
Practice	0.479	0.007**
Self-care behavior	0.218	0.012**
Other affecting factors		
- Nurses related factors	0.143	0.546
- Patients related factors	0.098	0.758
- Environmental related factors	0.241	0.343

Non significant p- value > 0.05**High significant p- value > 0.001

Discussion

The study was carried out to assess factors affecting AVF survival among the HD patients through assessing the survival time of AVF among the hemodialysis patients and assessing factors affecting AVF survival among the HD patients.

Regarding demographic characteristics the result of the current study indicated that the mean age of studied nurses was 33.30 ± 11.58 years and more than two fifths of them, their age ranged between 18-< 30 years, young age of nurses in the studied sample may be explained as they provide direct nursing care to the HD patients whereas elderly nurses are occupied with administrative tasks. This, perhaps, reflects the demanding nature of dialysis service.

This finding goes in the same line with study conducted by *Al-Mawsheki et al., (2016)* entitled "Nurses' knowledge and practice regarding the care for the patients during HD " which revealed that, more than half of studied nurses their ages ranged between twenty to less than thirty years.

Regarding the gender of the studied nurses the present study result showed that, two three fifths of them were females, this might elaborated the current condition due to females continue to dominate the profession and men are still a minority among those who practice nursing. This is inagreement with *Ibrahim et al., (2018)* in a study entitled "Assessment of nurses' performance regarding the care of children undergoing HD therapy at Abu El-Rish child Hospital and Ain Shams University

Hospitals" which revealed that, more than three quarters of them were females.

Regarding marital status the present study result showed that, three fifths of the studied nurses were married this due to suit the living condition and this traditional in live. This finding is consistent with *Moursy & Sharaf (2017)* in a study entitled **"Vascular access care at hemodialysis unit; nurses compliance to infection prevention and control practices".** Which showed that, nearly three quarters of the studied sample were married.

Regarding nurses' educational level, it was found that, more than half of them were graduated from nursing schools. These results might be due to the most of bedside nurses who work in governmental hospitals had technical nursing and diploma degrees. This study was in contrast with a quasi-experimental study conducted by *Ahamed and Sallam (2018),* entitled "The effect of nursing instructions on nurses' knowledge, practice and suggestions regarding adverse events in HD" on 26 nurses, working at HD unit in Hail City (Kingdom of Saudi Arabia) and found that, more than half of studied nurses had degree of diploma in light to the economic condition as family prefered nursing schools as it required shorter duration for graduation and less costs than technical institutes and bachelor's degree. Also, related to considering the learning and social differences between the two different communities.

Regarding years of experience of the studied nurses, the current study revealed that, half of them had more than 10 years of experience in HD unit, These finding goes in in the same line with a quasi-experimental one-group pretest-posttest study conducted by *Pássaro and D'Ávila (2018)* who studied "Nursing educational

intervention for the identification of adverse events in HD" carried on 16 nurses in Brazil and reported that, of the 16 nursing technicians participating, the mean time of experience in the HD sector was 10 ± 5.9 years.

Moreover, this current study finding is in disagreement to **Saleh et al. (2018)** quasi-experimental study entitled "Nurses compliance to standards of nursing care for HD patients: educational and training intervention" on 41 nurses working in the HD unit at El-Menia University Hospital, Egypt, conducted and reported that, two fifths of them had years of experience ranged from 5 to 10 years.

Regarding the previous training courses of the studied nurses, the current study revealed that, two thirds of the nurses had previous training courses regarding nursing care for HD patients and less than half of them took two training courses. This result could be due to limited attention of nurses to receive training programs about AVF care. This finding is disagreed with **Al-Mawsheki et al., (2016)** who showed that, two fifths of studied nurses were attended training course.

Regarding total level of nurses' knowledge the result of the current study revealed that, more than half of the studied nurses had satisfactory level of total knowledge regarding AVF care. This result is in disagreement with **Abdel-latif et al., (2019)** in their study entitled "Assessment of nurses knowledge and practices regarding complications of hemodialysis patients in intensive care Unit" which showed that, the majority of the studied nurses had unsatisfactory knowledge.

Regarding total level of other factors affecting AVF survival from the nurses' point of view, the present study showed that, most of the studied nurses reported that, other nurses related factors including (commitment to infection control methods, skills training about AVF care, communication & health education to patients, educational level, job satisfaction, experience years, shortage of nursing staff & frequency of AVF site puncture) had high effect on AVF survival followed by environmental related factors including (availability of hygienic products to disinfect and wash hands,

availability of disposable medical supplies for the patient's need for appropriate needle sizes and filters, keeping clean and safe environment & availability of personal protections) and patients related factors including (personal hygiene level, work nature, educational level, ability to evaluate the AVF, have chronic diseases as hypertension & diabetes mellitus, psychological status & adaptation to health).

The current study finding is contradicted with the previously mentioned study conducted by **Shahdadi and Rahnama (2018)** entitled "Experience of nurses in HD care: a phenomenological study" which reported that, nurses' experience in the HD department showed that, they had many inhibitory factors in the process of providing care to patients. Some of them were related to nurses (shortage of nurses, nurses' financial and family problems, inexperienced nurses, nurses' fatigue and mental stresses, and heavy work shifts). While some factors were related to patients (patient's emotional sensitivity and difficulty in attracting patients' trust), and some factors were due to poor management (inadequate ventilation of the department, lack of equipment technician, shortage of devices and equipment, and weak cooperation of head nurse with nurses).

The majority of prior researches were mainly emphasized on the associated comorbidities as well as the concomitant therapies. But factors affecting AVF survival need more reseaches to cover all factors affecting negatively or positively on its survival to take into consideration in caring the HD patients for increasing its efficacy.

Regarding total level of nurses' practice the result of the current study revealed that, more than half of studied nurses had unsatisfactory level of total practice regarding AVF care**.** This result is in agreement with **Abdel-Latif et al., (2019)** who showed that, more than two thirds of the studied nurses have inadequate level of practice.

Regarding the studied patients' self-care practice regarding AVF care, this study demonstrated that, the majority of them washed the fistula arm with soap and water before entering the HD room, did not allow blood sampling in the fistula arm& more than one fifth

of them applied heat on local hematoma after the first 24 hours. Also, more than two fifths of them checked every day if the color of the hand from the fistula arm changed, most of them did not use tight clothes in the fistula arm and shave the hair on the fistula arm. This caring could be attributed to the instruction received to the studied patients from the vascular surgen after AVF creation.

Different results were reported by a descriptive exploratory research design by ***Diab and Mostafa (2020)*** in their study entitled **"**Self-care behaviors for AVF among HD patients at Assiut University hospital, Egypt" carried on 540 patients. This study presented that, more than three quarters of patients had inadequate self-care behaviors and more than one fifth of them had adequate self-care behaviors.

Additionally, the current study is congruent with study conducted by ***Alsaqri et al., (2019)*** entitled "The effectiveness of instructional module on self-care practices of arteriovenous fistula among hemodialysis patients at Hail region, Saudi Arabia". Which showed an increase in mean score on general instructions about AVF care from 1.78 ± 0.33 in pre-test and the mean score of knowledge about look for infection from 2.04 ± 0.51 in pre-test has observed. Moreover, the increase of the mean score of knowledge related to the assessment of AVF function from 2.0 ± 0.38 in pre-test with statistically significance improvement $p < 0.5$.

Interestingly, other similar results were reported by ***Gaffer and Ibrahim (2021),*** who revealed that less than half of the studied patients had satisfactory self-care practices pre teaching guideline implementation.

Regarding relation between the studied patients AVF survival time and the nurses total level of knowledge, practice and the patients self-care behavior. The present result revealed that, there was highly statistically significant relation between survival time of AVF (years) and nurses total level of knowledge and practice among the studied patients at p. value <0.001 . While, there was statistically significant relation between survival time of AVF and the patients' self care behavior

at p. value <0.05. This means that the mentioned studied variables affect on AVF survival time .This finding disagrees with ***Nwaomah et al., (2020),*** who stated that, there was a significant relation between nurses' knowledge and AVF failure with (P=0.006 < 0.05), but there was no significant relation between nurses' needling technique and AVF failure with (P=0.086 > 0.05).

Also, this finding goes in the same line with ***Diab and Mostafa (2020),*** who revealed that highly significant difference between self-care behaviors of studied sample and number of AVF and its survival time .

Correlation between the studied patients AVF survival time of AVF and the nurses total level of knowledge, practice, the patients self-care behavior, and other affecting factors the present study showed that, there were highly statistically significant correlation between AVF survival time and nurses total level of knowledge, practice and patients' self-care behavior at p. value <0.001. While, there was no statistically significant correlation between AVF survival time and other affecting factors; nurses, patients environmental related factors at p value > 0.05. From the researcher' point of view, the nurses with satisfactory level of knowledge, practice and the patients with satisfactory level of self care behavior will affecte positively on AVF survival time. This results in the same line with the study performed by ***Diab and Mostafa (2020)*** who found that there was a highly significant difference between self-care behaviors of studied patients and AVF survival**.**

This result is in the same line with the study performed by ***Bayoumi and Khonji (2020)*** who revealed that the positive correlation variables were between cannulation techniques and VA complications, duration of dialysis and complication during the dialysis session. Furthermore, the most common complication related to needling practice was an aneurysm. Additionally, he recommended that following cannulation technique guidelines would prevent potential complications, increase VA durability and improve patients' quality of life. Further research needed to analyze the factors that may be affecting VA patency and evaluate the

application of cannulation technique guidelines as a prospective study to identify the clinical relevance for VA complication.

A weak point of the study is that it does not covered the surgical related factors affecting AVF survival among HD patients, these factors are very important and affect directly on AVF failure. Furthermore, this study was applied in only one dialysis unit in the selected setting, so the results may be limited to the unit with similar size and employee characteristics.

Conclusion:

The result of this study concluded that:

Many factors affecting AVF survival time, whereas more than half of the studied nurses had unsatisfactory level of knowledge and practice regarding AVF care . Also, around half of the studied patients had satisfactory level of self care behavior. Moreover, from the studied nurses point of view, most of them reported that other nurses related factors including (commitment to infection control methods, skills training about AVF care, communication & health education to patients, educational level, job satisfaction, experience years, shortage of nursing staff & frequency of AVF site puncture) had high effect, followed by environmental related factors including (availability of hygienic products to disinfect and wash hands, availability of disposable medical supplies for the patient's need for appropriate needle sizes and filters, keeping clean and safe environment & availability of personal protections) and patients related factors including (personal hygiene level, work nature, educational level, ability to evaluate the AVF, have chronic diseases as hypertension & diabetes mellitus, psychological status & adaptation to health).

Recommendations

Based on the results of the present study the following recommendations are suggested:

Recommendation related to nurses

- Continuously regular in-service training and educational programs or refresher courses about AVF care should be conducted for the nurses in HD unit. This should provide them with up-dated knowledge, which can be translated into practice for maintaining AVF survival time and efficacy of HD.

- Designing a booklet containing the knowledge, related to the AVF care for nurses working in the HD unit to ensure that, it is in their hands and acts on it as, a standardized guideline protocol in their practice.

- Periodic evalution of knowledge and practice for all HD nurses regarding AVF care to identify their needs and develop learning strategies accordingly.

Recommendations related to patients

- The patients education program should be conducted to know how to examine the efficacy of their AVF access daily, while at home and report for redness or swelling around the fistula, experiencing any pain in the fistula area or increased body temperature.

- Every patient on HD should have a declared plan after each session for caring & preserving the AVF to maintain its survival.

- Arabic colored booklet regarding AVF self-care guidelines should be available in each dialysis hall and given to each HD patient to be engaged in the VA process maintenance

Recommendations for Further Studies

Another area of researches that could also be extensively investigated are the following:

1. Effect of an educational program about AVF care on the HD nurses' performance &conscequently on AVF survival time.

2. Effect of an educational guidelines about the HD patients AVF self-care on its clinical outcomes.

3. The study should be replicated on large sample and in different hospital setting for studying other factors affecting AVF survival time in order to generalize the study results.

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