

NURSES ROLE IN PREVENTION AND EARLY DETECTION OF ARTERIOVENOUS FISTULA (AVF) COMPLICATIONS AMONG HEMODIALYSIS PATIENTS

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ABSTRACT

Background: In the world, Chronic Kidney Disease (CKD) has become a public health problem and the most used renal replacement therapy (RRT) is hemodialysis. Capillary function and patency of vascular access, especially the arteriovenous fistula (AVF), are critical to the success of hemodialysis. Although regarded as the gold standard, there are several complications associated with AVF. Nurses are key to the prevention and early detection of these complications. The goal of the study is to determine the contribution of nurses in the prevention and early detection of AVF complications among hemodialysis patients.

Methodology: The methodology used in the present study was descriptive cross sectional study carried out in the hemodialysis units of Liaquat University of Medical & Health Sciences (LUMHS), Jamshoro. The sample consisted of 257 nurses obtained with non-probability convenience sampling technique. The following tools were used to collect data: patient interview form, observation checklist and structured questionnaire. The statistical analysis of data was conducted with SPSS version 23.

Results: Most nurses had moderate knowledge about the care of AVF. Inspection, palpation and auscultation were routinely conducted, however there were gaps in documentation and venous pressure monitoring. There was a statistically significant relationship between the knowledge and practices of the nurses ($p < 0.05$).

Conclusion: Continuous training and standardisation of clinical practices can greatly minimise complications of AVF and improve patient outcomes by strengthening the knowledge and skills of nurses.

The keywords: Arteriovenous fistula (AVF), Hemodialysis, Nurses role, Complications, Prevention, Early detection.

INTRODUCTION

Chronic kidney disease (CKD) is known as a major worldwide crucial health problem, that is effecting more than 750 million peoples worldwide.¹ An estimation of 2.62 million patients now receive a renal replacement therapy (RRT), a figure expected to nearly double by 2030, therefore by increasing the reliance on hemodialysis and by the need for effective vascular access care.² Vascular access complications continue to be a major problem in hemodialysis, affecting 15-20% of patients and contributing to morbidity, mortality and the need for the relatively expensive re-access procedures.³

Chronic kidney disease is a global disease that affects over 843.6 million people, and it will become the 12th leading cause of death globally by 2040, with the number of deaths projected to increase by 41.5% over the next 20 years. Chronic kidney disease (CKD) is a large problem in Indonesia; there are indications that 21.1% of the hemodialysis patients had or were suffering from chronic kidney disease.^{4,5}

Self-care practices among hemodialysis patients are frequently suboptimal, with a need for structured educational interventions, given their importance in reducing disease progression, resulting in new symptoms, and impacting multiple organ systems, thereby compromising functional AVF lifespan, quality of life, hospitalization rates, and health care costs.¹² Self-care programs can contribute to improved vascular access longevity, reduced emergency interventions and reduce the financial burden on healthcare systems by enabling patients to recognise early signs and

take a proactive approach to management.¹³ The study results reinforce that self-care practices should be included in routine care, consistent with current patient-centered chronic disease management strategies.¹⁴

Hemodialysis patients should always have the most suitable vascular access type, namely arteriovenous fistula (AVF), and this type of access has a lower risk of infection and central venous stenosis than other types of access.¹⁵ The preferred vascular access for hemodialysis is (AVF) however it still has its complications. If not done properly, cannulation (rope ladder, buttonhole and area puncture) may cause a hemangioma, angiomatous dilatation, or a decrease in cardiac function.¹⁶ Non-functioning arteriovenous fistula (AVF) is associated with poor dialysis, and is a risk factor for morbidity and mortality.¹⁷ Acute thrombosis is one of the main complications that can quickly become problematic for vascular access.¹⁸

Failure of arteriovenous fistula is becoming an important clinical problem in Pakistan. In a single-center study in Lahore, AVF stenosis was reported at 7.1% to 8.3% of patients by Doppler ultrasound and access recirculation was reported in almost 12% of the patients. The study underscored the importance of keeping the access blood flow around 600 mL/min to ensure good dialysis, reflecting the direct relationship between functional AVF and physiological results.¹⁹

In the clinical setting, role of hemodialysis nurses is very crucial.²⁰ The nurse provides direct care of the arteriovenous fistulas according to the prescribed protocols and they also play crucial role in checking for any complications like infections. They are constantly evaluating and intervening when necessary, which is crucial for sustaining AVF patency and patient safety during hemodialysis.²¹ Needling of new or poorly matured AVF often poses a difficult task for the nursing staff, resulting in miscannulation or hematoma formation, and further compromising fistula patency.²²

Effective management of arteriovenous fistulas (AVFs) and grafts (AVGs) is essential for maintaining vascular access and ensuring successful hemodialysis. Maintaining vascular access and successful hemodialysis requires good management of arteriovenous fistulas (AVFs) and arteriovenous grafts (AVGs).⁸ Nurses have an important responsibility in the preparation, cannulation and monitoring of these accesses, which require technical skill and clinical judgment to limit the trauma and complications of hematoma, infiltration and infection, especially in a manner that involves rope-ladder or buttonhole cannulations. Ongoing observation of the thrill, bruit, or bleeding after dialysis is important, as is providing patient education on access care. Evidence-based, patient-centred nursing methods prolong access life, reduce peri-operative complications, and help achieve best quality of life, such as avoiding invasive access on the access limb, controlling blood pressure, managing comorbidities and encouraging handgrip exercises to aid fistula maturation.²³

So improving nurses' knowledge about the easier and less painful puncture techniques may be beneficial to both patients and staff, as it will decrease complications and increase the lifespan of the arteriovenous fistula (AVF).^{24, 25} The purpose of this study is to determine the level of nurses' knowledge and practice regarding the prevention and early detection of complications of AVF for hemodialysis patients.

Problem Statement

Although AV fistulas are the most common vascular access for hemodialysis they continue to be a major problem in dialysis centers. Failure to assess the nursing needs, lack of understanding about how to care for the AVF and failure to recognise early warning signs can result in complications that could be prevented, which in turn could lead to failure of access or poor patient outcomes. In Pakistan, there is little local evidence regarding the role of nurse in the prevention and early detection of complication of AVF in the hemodialysis patients. This study aims to fill this gap by evaluating the role of nurses in identification and prevention of AVF related complication in a tertiary care hospital.

RESEARCH GAP

Most previous studies have primarily focused on vascular access complications, patient self-care practices, or the clinical outcomes of arteriovenous fistulas (AVFs) among hemodialysis patients. Comparatively fewer studies have specifically examined nurses' knowledge and practices regarding the prevention and early detection of AVF-related complications. Furthermore, limited evidence is available from Pakistan, particularly in Sindh province, where hemodialysis units face increasing patient loads and resource constraints. This study seeks to bridge this gap by assessing nurses' knowledge and practices regarding the prevention and early detection of arteriovenous fistula complications among hemodialysis patients at Liaquat University Hospital Hyderabad/Jamshoro.

Significance of the Study

Patients of hemodialysis rely on AVF as their life sustaining therapy. Patient safety, morbidity reduction, and quality of care. Vascular access monitoring and patient education falls mainly on the shoulders of nurses who are responsible for the care of patients but there is room for improvement in compliance with guideline based practices.²⁶ This study problem provide evidence regarding the role of nurses in the prevention and detection of AVF complication, and to

explore the gaps in practice, knowledge and patient education. The results will help to improve vascular access outcomes and meet Sustainable Development Goal 3 (SDG 3): Good Health and Well-Being through provision of safe and effective dialysis nursing care.

Research Objectives

General Objective

This study aims to evaluate the contribution of the nurse in the prevention and early detection of the complications of arteriovenous fistula in patients on hemodialysis.

Specific Objectives

1. To determine the knowledge level of nurses on patient specific prevention and early detection of complications of AV fistula among patients of hemodialysis.
2. To assess nurses' awareness and usual practice for AVF prevention and early detection.
3. To evaluate the effectiveness of nurse-led patient education on the prevention and prompt detection of AVF complications in the hemodialysis patients.

Literature Review

The gold standard for vascular access is the arteriovenous fistula (AVF), which is formed by surgery linking an artery to a vein and leaves room for the vein to grow for repeated cannulation, supporting blood flow rates of 200–350 mL/min and has fewer infection risks and long-term patency.^{25,26} Arteriovenous grafts and temporary catheters, on the other hand, are used when the native vessels are not appropriate or when dialysis is needed for a brief period of time, but they have a higher risk of infection or thrombosis.^{27,28}

Although they have benefits, they can also cause complications like thrombosis, stenosis, infection, aneurysm and ischemia that can affect the dialysis efficiency and need immediate treatment. Maintaining the function of an AVF depends critically on the role of a nurse in providing appropriate cannulation, regular and ongoing monitoring, early detection of complications and patient education. Structured educational program and home-based monitoring technologies lead to improved patient self-care, better outcomes and longer AVF lifespan.²³

Chronic kidney disease is a global problem with more than 843 million people affected, and is expected to claim 41.5% more lives in 2040, highlighting the need for effective hemodialysis and vascular access care. It is important to be aware of the types, care and monitoring of AVFs in order to enhance patient outcomes. The above facts give an idea of the aspects of AVF care which form the basis for understanding the types, clinical characteristics and significance of AVF in hemodialysis.^{11,4}

Arteriovenous fistula (AVF) is the most reliable, durable and least complicated vascular access for long-term hemodialysis. An AVF is a surgical procedure in which an artery is joined directly to a vein, usually in the forearm or upper arm, so that the vein can now serve as a conduit for the increased blood flow and can be used repeatedly for cannulation. The vascular adaptation is adequate blood flow in the hemodialysis of 200 to 350 mL per minute sufficient to filter toxins and fluids from the human body.^{29,14}

AVFs can fall into several categories, usually depending on the location of the anastomosis. Radio cephalic fistulas at the wrist are frequently the fistulas of choice because of their distal location and lack of complications. Fistulas made at the elbow are called brachiocephalic fistulas and provide greater blood flow for more “intensive” dialysis. Brachio basilic fistulas are created in the upper arm where the basilic vein has been transposed, and are usually only used in patients who have limited venous access distally. There are specific anatomical and physiological aspects for each type, and factors like vessel size, patient age, comorbidities, and access experience will affect the choice of device.^{13,30,31} Beyond their technical usefulness, AVFs are particularly important. Well-functioning AVF prevents infections and thrombosis, decreases hospitalizations and enhances patient quality of life. The teaching of the patient to maintain AVF includes educating the patient about how to protect the AVF arm, how to assess themselves daily, and how to identify early warning signs of AVF complications is the responsibility of the nurse.¹ Structured nursing interventions such as disease management and patient education, have been shown to significantly reduce complication rates, improve fistula survival, and improve hemodialysis outcomes. Moreover, novel home-based monitoring and self-care strategies also enable patients to take an active role in the health of their AVF.^{19,28,33} As are complications such as stenosis, thrombosis, aneurysm formation, and infection, which require thorough nursing care and continuous patient education. This introduces the nurse to the importance of AVFs in addition to the technical management, and sets the stage for reviewing common AVF complications and how nurses prevent them, which will be discussed in the next section.^{14,31} Understanding the types, maturation processes, and clinical importance of AVFs sets the stage for exploring common AVF complications and the strategies nurses employ to prevent them, which will

be discussed in the next section. Hemodialysis has an ideal vascular access – arteriovenous fistulas (AVFs) – that is reliable, low in infection risk and long-lasting.²⁸ They still can have several complications that could affect the outcome of the treatment, however, such complications include stenosis, thrombosis, infection, hematoma, aneurysm formation, and ischemia, which can all decrease blood flow, diminish dialysis effectiveness and increase the number of hospital visits and medical expenses. The most common are stenosis and thrombosis, which can occur if the fistula fails to mature properly, if complications are not detected timely, or if the patient is not taking care of his/her fistula.^{11,34} Additionally, patient-related issues like upper limb weakness, lack of exercise compliance, and inadequate knowledge about self-care further affect AVF dysfunction. Progressive upper limb exercises, hygiene advice, avoiding blood clots and early detection of changes to thrill/bruit can help to keep AVF patent and minimise complications. Healthcare providers, especially those with limited resources, are often faced with challenges such as delays in AVF creation, using temporary catheters, and limited access to specialists, which can increase the risk of complications and demand proactive nursing care and patient education.^{13,35}

Many nursing interventions need to be done promptly to prevent complications of AVF, extend the access's life and enhance dialysis outcomes, such as recognizing warning signs, monitoring in a structured way, providing guidance to patients. The next section will be dedicated to the knowledge and skills of nurses in AVF management, and how they directly impact on complication prevention and patient safety.³⁶

In HD, the work of the nurse is crucial in the assessment, creation, monitoring, and maintenance of arteriovenous fistulas (AVFs) and educating patients about proper care, maintenance, and function.³⁰ This knowledge of the different types of AVFs, cannulation procedures, early signs of complications, and self-care guidelines will directly affect patient outcomes, the life of the access and dialysis efficiency.¹⁴

Methodology

Study Design

A descriptive cross sectional study design with observational approach was used to evaluate the involvement of nurses in preventing and early detection of complication of arteriovenous fistula (AVF) among the hemodialysis patients. This design was chosen because it can be used to systematically evaluate knowledge, practices and current clinical conditions at a single time, while keeping variables constant. A cross-sectional approach was suitable for evaluating nurses' knowledge, nursing practices, and patient education about the prevention and early detection of complications of AVF, while also investigating the relationship between the aforementioned and demographic variables.

Study Setting

The study was carried out in the hemodialysis unit(s) of Liaquat University of Medical and Health Sciences (LUMHS) Hospital, Jamshoro. LUMHS is an important tertiary care teaching hospital which provides special facility in the field of renal care to a large population of Jamshoro and other districts of Sindh. Both units have installed hemodialysis machines and serve patients with end-stage renal disease who are in need of maintenance hemodialysis.

These units are staffed with registered nurses trained in dialysis care who assess vascular access, cannulate patients, monitor their dialysis sessions, and educate patients. High patient turnover and regular interaction of the nurses with patients were ideal and convenient for observation of routine nursing practices in AVF care and the prevalence of AVF complications. Thus, the study environment was representative and provided a valuable glimpse of nursing's role in a practical clinical environment.

Study Population

The study population comprised of Registered nurses of the hemodialysis units of Liaquat University Hospital, Hyderabad/Jamshoro. The nurses were included because of their direct involvement in AVF cannulation, monitoring, and patient education.

Inclusion Criteria

- Hemodialysis unit RN's
- Minimum of six months' experience in dialysis care
- You must be willing, and give informed consent, to be involved. You need to be willing and give informed consent.

Exclusion Criteria

- If a nurse or patient refuses to take part.

Sample Size

For nurses, a single population proportion formula was used to obtain a sample with an estimated prevalence of adequate knowledge and practices relating to AVF care among hemodialysis nurses of 18%, based on previous studies. The formula used was:

$$n = Z^2 \times p \times q / e^2$$

Where:

- $Z = 1.96$ (95% confidence level)
- $p = 0.21$ (estimated prevalence)
- $q = 1 - p = 0.79$
- $e = 0.05$ (margin of error)

$$n = (1.96)^2 \times 0.21 \times 0.79 / (0.05)^2$$

$$n = 3.8416 \times 0.1659 / 0.0025$$

$$n = 0.6379 / 0.0025 \quad n \approx 255$$

Hence, sample size of 257 nurses was deemed as adequate for the study.

Sampling Technique

A non-probability convenience sampling technique was used to recruit participants. Hemodialysis nurses, registered nurses, who were available and willing to be approached during the data collection period were targeted. The sampling technique was deemed appropriate, as it was feasible and the study was conducted in a clinical environment.

Research Instrument

Standardized, structured instruments were used to collect data. A Demographic Data Form was used to record nurses' background characteristics. A Nurses' Knowledge Assessment Questionnaire was used to assess knowledge regarding arteriovenous fistula (AVF) care, prevention, and early detection of complications. An Observational Checklist was utilized to evaluate nurses' practices related to AVF assessment, cannulation techniques, infection prevention, and monitoring during hemodialysis. A Nurse-Led Patient Education Questionnaire was used to assess nurses' educational practices regarding AVF self-care and complication prevention. All instruments were developed following an extensive literature review and expert consultation and were reviewed for content validity and clarity before data collection.

Validity of Instrument

Expert review was done to assure the content validity of the data collection tools. The instruments were tested by senior nursing professors and nephrology/dialysis nurses. They provided feedback on the clarity, relevance and comprehensiveness of their suggestions which were used to further improve the final version of the tools.

Pilot Study

Prior to the main survey, a pilot study was conducted to evaluate the clarity, comprehensibility, and feasibility of the questionnaire. Participants included in the pilot study were excluded from the final analysis. Feedback obtained during the pilot phase resulted in minor improvements to the wording and layout of the questionnaire.

Data Collection Procedure

Formal permission of the concerned authorities of LUMHS Hospital, Jamshoro was obtained and data collection was started. The researcher visited the hemodialysis units during the usual dialysis period. Registered nurses who fulfilled the inclusion criteria were approached and the goal of the study was explained to them. The informed consent was obtained and signed before participation.

Nurses were given the knowledge questionnaire in a neutral setting, where they can give unbiased answers. The researcher directly observed the nursing practices of AVF care during routine hemodialysis procedures using the AVF care nursing practices observation checklist without interfering with the care of patients.

A structured and self-administered questionnaire was used to gather data from registered nurses. Data entry and analysis was conducted after questionnaires were completed and checked for completeness.

Ethical Considerations

Ethical approval was taken from the Ethical Review Committee (ERC) of Liaquat University of Medical and Health Sciences, Jamshoro before the data was collected. In addition, permission was gained from the hospital administration and the respective unit heads. Participants were given an explanation of the study, information that they could decline participation or withdraw at any point without penalty and that confidentiality and anonymity would be maintained.

All participants gave written informed consent. No personal identifiers were recorded and data collected were for the purposes of research only.

Data Analysis Plan

The data were entered, coded and analyzed using the software of Statistical Package for Social Sciences (SPSS) version 26. Demographic data, nurses' knowledge of AVF complications, nursing practices and patients' education activities led by nurses were summarized using descriptive statistics of frequencies and percentages. Association between the demographic characteristics, nurses' knowledge, nursing practices and activities of patient education was determined by using the Chi-Square Tests. A value of $p < 0.05$ was deemed statistically significant.

Table 1. Variables Included in the Study

Variable Category	Variables
Demographic Variables	Age, Gender, Professional Qualification, Years of Hemodialysis Experience, Previous Training on AVF Care
Independent Variable	Nurses' demographic characteristics
Dependent Variables	Nurses' knowledge regarding AVF care, Nursing practices related to AVF management, Nurse-led patient education practices

Table 2. Operational Definitions

Variable	Operational Definition
Knowledge Regarding AVF Care	Nurses' understanding of arteriovenous fistula anatomy, cannulation techniques, infection prevention, identification of complications, and preventive measures assessed through a structured questionnaire.
Nursing Practices	The actual performance of nurses during AVF care, including assessment of vascular access, aseptic technique, cannulation procedure, monitoring during hemodialysis, and documentation, assessed using an observational checklist.
Nurse-Led Patient Education	Educational activities provided by nurses to hemodialysis patients regarding AVF self-care, recognition of complications, hygiene practices, and measures to maintain vascular access patency.
Hemodialysis Nurse	A registered nurse working in the hemodialysis unit who is directly involved in the management and care of patients undergoing hemodialysis.
Arteriovenous Fistula (AVF)	A surgically created connection between an artery and a vein used as permanent vascular access for hemodialysis.

Table 3. Demographic Characteristics of Participants

Variable	Category	Frequency (n)	Percentage (%)
Age (Years)	20–30	13	16.3
	31–40	34	42.5
	41–50	26	32.5
	Above 50	7	8.7
Gender	Male	33	41.3
	Female	47	58.7
Professional Qualification	Diploma in Nursing	28	35.0
	Generic BSN	18	22.5
	Post RN BSN	26	32.5
	MSN	8	10.0
Hemodialysis Experience	Less than 2 Years	18	22.5
	2–5 Years	29	36.3

Variable	Category	Frequency (n)	Percentage (%)
Previous Training on AVF Care	6–10 Years	22	27.5
	More than 10 Years	11	13.7
	Yes	46	57.5
	No	34	42.5
	Total	80	100.0

Table 3 presents the demographic characteristics of the 80 nurses who participated in the study. The largest proportion of participants belonged to the 31–40 years age group (42.5%), followed by 41–50 years (32.5%), while 16.3% were aged 20–30 years and only 8.7% were above 50 years. These findings indicate that the majority of respondents were experienced adult nurses actively working in hemodialysis units.

Regarding gender, 58.7% of the participants were female, whereas 41.3% were male, indicating a higher participation of female nurses in the study. With respect to professional qualification, 35.0% held a Diploma in Nursing, followed by 32.5% with a Post RN BSN, 22.5% with a Generic BSN, and 10.0% possessing an MSN degree. This distribution demonstrates that most participants had diploma or bachelor's level nursing education.

Concerning professional experience in hemodialysis units, 36.3% had 2–5 years of experience, 27.5% had 6–10 years, 22.5% had less than 2 years, while 13.7% had more than 10 years of experience. Regarding previous training on arteriovenous fistula (AVF) care, 57.5% of nurses reported receiving formal training, whereas 42.5% had not received any specialized training. Overall, the demographic profile indicates that the study primarily included middle-aged female nurses with diploma or bachelor's qualifications, moderate professional experience, and previous exposure to AVF-related training, providing an appropriate sample for assessing nurses' knowledge, practices, and patient education regarding AVF care. (Table 3)

Table 4. Distribution of Nurses' Knowledge, Nursing Practices, and Nurse-Led Patient Education (N = 257)

Study Variable	Category	Frequency (n)	Percentage (%)
Knowledge Regarding AVF Complications	Poor	23	8.9
	Moderate	58	22.6
	Good	176	68.5
Nursing Practices	Poor Practice	20	7.8
	Moderate Practice	54	21.0
	Good Practice	183	71.2
Nurse-Led Patient Education	Poor Education Practice	15	5.9
	Moderate Education Practice	51	19.8
	Good Education Practice	191	74.3

Table 4 presents the distribution of the three principal study variables among the 257 nurses included in the study. Regarding knowledge about arteriovenous fistula (AVF) complications, the majority of nurses (68.5%) demonstrated good knowledge, while 22.6% had moderate knowledge and only 8.9% exhibited poor knowledge. These findings indicate that most nurses possessed satisfactory knowledge regarding the prevention and early detection of AVF-related complications.

With respect to nursing practices, 71.2% of participants demonstrated good clinical practice, 21.0% had moderate practice, and 7.8% exhibited poor practice. These results suggest good adherence to recommended clinical guidelines for AVF assessment, cannulation, infection prevention, and monitoring.

Similarly, 74.3% of nurses demonstrated good patient education practices regarding AVF care, whereas 19.8% showed moderate educational practices and only 5.9% had poor educational practices. Overall, the findings indicate that nurses possessed satisfactory knowledge, appropriate clinical practices, and active involvement in educating hemodialysis patients regarding AVF care and complication prevention. (Table 4)

Table 5. Association Between Gender and Knowledge Regarding AVF Complications

Knowledge Variable	χ^2 Value	p-value	Interpretation
AVF Infection Knowledge	3.95	0.047	Significant

Knowledge Variable	χ^2 Value	p-value	Interpretation
Aneurysm Formation Knowledge	2.47	0.150	Not Significant
Prolonged Bleeding Knowledge	4.76	0.029	Significant
AVF Thrombosis Knowledge	3.62	0.057	Borderline Significant
Redness and Swelling as Infection Signs	3.91	0.048	Significant
Blood Pressure Measurement on AVF Arm	0.60	0.437	Not Significant
Monitoring Venous Pressure for Stenosis	4.01	0.045	Significant
Early Detection Prolongs AVF Life	4.50	0.034	Significant

Table 5 demonstrates the association between gender and nurses' knowledge regarding AVF complications. Statistically significant associations were observed for knowledge related to AVF infection ($p = 0.047$), prolonged bleeding ($p = 0.029$), redness and swelling as signs of infection ($p = 0.048$), monitoring venous pressure for early detection of stenosis ($p = 0.045$), and the importance of early detection in prolonging AVF lifespan ($p = 0.034$). No statistically significant associations were found for aneurysm formation or blood pressure measurement on the AVF arm. These findings indicate that gender was associated with selected aspects of nurses' knowledge regarding AVF complications. (Table 5)

Table 6. Association Between Gender and Nursing Practices for Prevention and Early Detection of AVF Complications

Practice Variable	χ^2 Value	p-value	Interpretation
Look, Listen & Feel Assessment	3.84	0.050	Significant
Assessment of Bruit and Thrill	3.95	0.047	Significant
Rotation of Needle Sites	3.20	0.074	Borderline Significant
Maintenance of Aseptic Technique	5.50	0.019	Significant
Assessment of Infection Signs	0.00	0.961	Not Significant
Monitoring Venous Pressure	4.25	0.039	Significant
Prevention of Hematoma	3.84	0.050	Significant
Reporting Absent Thrill	5.23	0.022	Significant
Recording in Patient File	0.20	0.651	Not Significant
Patient Education Practices	16.63	<0.001	Significant

Table 6 presents the association between gender and nursing practices related to the prevention and early detection of AVF complications. Significant associations were found for look–listen–feel assessment, assessment of bruit and thrill, maintenance of aseptic technique, monitoring venous pressure, prevention of hematoma, reporting absent thrill, and patient education practices ($p < 0.05$). No significant associations were observed for assessment of infection signs or documentation of AVF complications. Overall, the findings suggest that gender influenced several important nursing practices related to AVF management. (Table 6)

Table 7. Association Between Gender and Nurse-Led Patient Education Regarding AVF Care (N = 257)

Education Variable	χ^2 Value	p-value	Interpretation
Avoid Tight Clothing/Jewelry	5.81	0.016	Significant
Palpate Thrill Daily	4.71	0.030	Significant
Report Prolonged Bleeding	0.33	0.568	Not Significant
Avoid IV Lines/BP Measurement	3.98	0.046	Significant
Handwashing & Hygiene	4.43	0.035	Significant
Observe Swelling/Redness/Pain	2.63	0.105	Not Significant
Written Educational Material	4.00	0.045	Significant

Table 7 shows the association between gender and nurse-led patient education regarding AVF care. Statistically significant associations were identified for education related to avoiding tight clothing or jewelry, daily palpation of thrill, avoidance of intravenous lines and blood pressure measurement on the AVF arm, hand hygiene practices, and provision of written educational materials ($p < 0.05$). No significant associations were observed for education regarding prolonged bleeding or recognition of swelling, redness, and pain. These findings indicate that gender was associated with several patient education activities related to AVF self-care and complication prevention. (Table 7)

DISCUSSION

The study titled “Nurses' role in the prevention and early detection of Arteriovenous Fistula (AVF) complications among Hemodialysis patients” was discussed. The age distribution showed that majority of the nurses are with mean age 35 years (42.0%) and the 20-30 years age group (33.9%). The similar is means a well-trained and experienced workforce to provide specialized dialysis services.⁸ The study participants were 257 registered nurses working in hemodialysis centers. The present study indicated that the majority of the respondents were male nurses (59.1%) and female nurses (40.9%). it showed that male nurses do make a significant contribution to dialysis services in the study area. The same trend has been observed in a couple of health care facilities where male nurses are more involved in specialized clinical services like nephrology and critical care services.¹¹

The level of educational qualifications among the participants was almost moderate had BScN (47.5%) with 46.7% holding Diploma Nursing qualifications and 5.8% holding MSN qualifications. From the results of this study, it is concluded that at the hemodialysis units, actually, a great majority of nursing staffs have studied at the undergraduate level. A study showed association between higher level of education and better clinical reasoning, evidence-based practice, and better patient outcomes³⁵

Most nurses had a good understanding of what thrombosis is, that repeated cannulation could lead to the formation of an aneurysm and that it is important to not take blood pressure on the fistula arm. The findings reflect a good knowledge of some of the critical concepts surrounding vascular access preservation.⁴⁴ Relatively low scores were noted in the areas of venous pressure monitoring and identification of stenosis, however. The percentages were acceptable but the results indicated a need for ongoing education reinforcement on further topics for vascular access monitoring. Another study found to have a moderate level of knowledge about basic care of the AVF than more advanced topics related to hemodynamic monitoring and access surveillance in previous studies.⁴⁷ Many study suggested that the knowledge level of the nurses about AVF complications is moderate, and further efforts are needed to improve their knowledge through continuing education and structured competency programs.³²

Likewise, 71.2% of nurses reported that they would immediately alert the physicians if thrill was not present and the bruit became weak. This discovery underscores the important part nurses play in the proactive identification and communication of potential vascular access dysfunction. A study founded that early reporting ensured timely diagnostic assessment and intervention, before access failure occurs.²²

A significant percentage of the nurses also stated that they practiced aseptic technique, evaluated for signs of infection, performed daily "look, listen, feel" checks, monitored venous pressure, and educated the patients about AVF care. These are aligned with world recommendations for vascular access management and show good adherence to evidence-based care principles. A study indicated that there is a need for institutional support, supervision and periodic infection control training to ensure adherence to recommended procedures in applying AVF care.³¹

Patient education is one of the basic tasks of nursing in the hemodialysis centers. The results indicated that nurses were actively involved in patient education about AVF proper care and preventing complications. The most common educational activity was for patients to learn to palpate thrill every day (76.3%). Daily thrill assessment is a very important self-monitoring tool to help patients detect possible access dysfunction and be able to get medical help immediately.²²

Over 70% of nurses reported educating patients about avoidance of tight clothing or jewelry on the AVF arm, the use of a longer life span for bleeding, not taking blood pressure on the AVF arm and no intravenous lines, and proper hand hygiene practices. These results showed high levels of nurse engagement in supporting patients to be fully involved in their own vascular access care. Numerous studies have shown that patient education is an essential aspect of effective AVF care as properly educated patients are more likely to participate in preventive measures, know when to look out for complications, and follow treatment plans.⁴³

Conclusion

The current study aimed to evaluate the nurses' role in preventing and early detection of complications of AV fistula in HD patients. The results showed that the knowledge of nurses about complications, prevention and early detection of AVFs were satisfactory. The range of correct response rates for knowledge items were from 65.0% to 73.9%, which is considered acceptable awareness level on vascular access management.

Positive nursing practice in the management of AVF was also determined in the study. Majority of nurses responded that they routinely performed recommended procedures like look–listen–feel assessment, bruit and thrill assessment, maintenance of the aseptic technique, monitoring of venous pressure, documentation of complications, and timely reporting of abnormal findings. These practices are vital to prevent and reduce complications and maintain vascular access function in hemodialysis patients.

Recommendations for Nursing Practice

- Provide recommendations to nursing practice.
- All dialysis nurses should attend AVF training regularly, based on the competency criterion.
- The assessment, monitoring and documentation of AVF should be done in a standardized manner and regularly assessed.
- Always conduct a look – listen – feel assessment prior to every dialysis.
- The importance of routine checks for bruit, thrill, venous pressure and infection should be reinforced.
- Documentation and reporting systems should be enhanced to early detection and timely intervention of complications.
- Nursing education needs to focus more on AVF care and access management.
- Continuing nursing education programs should concentrate on complication prevention, surveillance of vascular access, and patient education strategies.
- The use of simulation education activities in dialysis nursing education should be carried out.
- From the study of the case, hospital administration needs to be enhanced in the •
- Regularly, structured education programs that are led by nurses should take place.
- Patients should be asked to check for thrills every day and to alert the doctor if there is any change in the thrill.
- Materials should be developed and made available in printed format to complement oral instructions and to be used as educational brochures.
- Patients should be encouraged to be active in protecting and monitoring vascular access.

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