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ORIGINAL RESEARCH

Evaluation of Pain Intensity Related to Arteriovenous Fistula Puncture among Hemodialysis Patients

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ABSTRACT

Background: Pain associated with arteriovenous fistula puncture is a significant problem among hemodialysis patients. The process of needle insertion often causes considerable physical and psychological discomfort, leading to a decrease in perceived quality of life.
Objectives: Evaluate the level of pain experienced by hemodialysis patients due to arteriovenous fistula puncture.
Methodology: A cross-sectional study design was used, with a sample size of 40 patients under hemodialysis. The intensity of pain was measured for these patients during the needle insertion by means of a rating analogies scale. The selection of the study sample was done through a purposive sample from a hospital setting. Data collection was conducted using the rating analogies scale. Descriptive statistics were used to analyze the data on pain intensity.
Results: The results showed that the intensity of pain ranged from moderate to severe. The discussion of the results focused on the implications of the findings for clinical practice and the need for further research in the area. The study highlighted the importance of considering the intensity of pain related to arteriovenous fistula puncture among hemodialysis patients, and the need for further research into interventions that can reduce the associated pain.
Conclusion and Recommendations: Based on the results of the study, it can be concluded that arteriovenous fistula puncture causes moderate to severe pain in hemodialysis patients. Therefore, it is recommended that healthcare providers should take necessary measures to reduce the intensity of pain during the procedure. These measures may include the use of pain-relieving medications and other methods such as distraction, relaxation techniques and cryotherapy.

Keywords: Evaluation, Pain Intensity, Arteriovenous Fistula Puncture, Hemodialysis Patients.

INTRODUCTION

When certain vital organs, such as the kidneys which are responsible for maintaining the body's homeostasis, are impaired either structurally or functionally for a period of three months or more, this can lead to a decrease in the efficiency of bodily processes. This is what is seen in Chronic Kidney Disease (CKD), a clinical condition caused by irreversible damage to the kidneys (Al-Mudheffer, et.al ,2016) (Ammirati, 2020). As the condition advances, it can eventually lead to the most severe

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form of kidney disease, known as end stage kidney disease (ESKD) (NICE, 2017), (Al-Ani & Mahmood, 2014)

Unfortunately, its prevalence is growing, causing a significant drop in quality of life and premature death (O'Connor & Corcoran, 2012), (Benjamin, & Lappin, 2021)

It was found that 75% of the study participants preferred dialysis to kidney transplantation, despite the latter being the more suitable treatment option. Reasons for this preference included the absence of an available kidney donor, inappropriateness of kidney transplantation, or unexpected diagnosis of kidney failure. There are two options of dialysis, hemodialysis and peritoneal dialysis (Ammirati, 2020)

Hemodialysis is a widely accepted medical procedure to treat chronic renal failure, and is a repetitive weekly treatment provided over the course of a patient's life. The purpose of hemodialysis is to filter and clean the blood of a patient with chronic renal failure. This can be done through arteriovenous fistula (AVF) (Ibrahim,et.al, 2022). An arteriovenous fistula (AVF) is a surgically-created connection between an artery and a vein in order to facilitate the flow of blood. The AVF is typically created in the arm, and is used in hemodialysis to permit the efficient exchange of blood between the patient and the dialysis machine. During hemodialysis, a large-gauge needle is inserted into the AVF to ensure that adequate blood flow is maintained. This needle is typically inserted into the arterial side of the AVF and is used to withdraw the blood for filtration, before returning it to the patient's body via the venous side of the AVF. During the procedure, a dialysis machine is used to remove toxins, water, and other waste products from the patient's blood, while also maintaining a balance of electrolytes. This helps to restore the patient's overall health and wellbeing (Chavda, & Singh, 2018), (Ibrahim,et.al, 2022). Hemodialysis patients undergoing long-term treatment often endure frequent venipuncture procedures that are considered one of the most painful experiences (Alhani, 2010).

The assessment of pain intensity among patients with chronic renal failure during the hemodialysis process is a critical area of study due to its substantial impact on patients' well-being. Despite the existing research by Jafari-Koulaee et al. (2020) and Kortobi etal. (2020), which highlights the moderate average pain reported by patients and its significance during hemodialysis, there remains a need for a more comprehensive understanding of this issue. While these studies contribute valuable insights into the prevalence and perception of pain, there is still a research gap that necessitates a deeper exploration of pain evaluation within the context of hemodialysis.

The available literature primarily focuses on the quantification of pain intensity, yet further investigation is required to elucidate the underlying factors contributing to this pain, its variations across different patient profiles, and the potential long-term implications on patients' quality of life. Additionally, existing studies emphasize the harmful and intolerable nature of pain during hemodialysis (Gonella et al., 2022), but a more nuanced exploration of the psychological and emotional dimensions of this pain experience is lacking.

AIMS OF THE STUDY

this study aims to delve into a comprehensive analysis of pain evaluation during the hemodialysis procedure, encompassing both the quantitative assessment of pain intensity and the qualitative exploration of patients' perceptions, coping mechanisms, and their impact on the overall hemodialysis experience. By addressing these research gaps, this study seeks to contribute valuable insights that could inform more tailored pain management strategies and interventions, ultimately enhancing the well-being and treatment experience of hemodialysis patients.

METHODOLOGY

Design of The Study:

A quantitative descriptive cross-sectional design was used in the current study to assess the pain intensity related to arteriovenous fistula puncture among hemodialysis patients.

Ethical Considerations:

The researcher adhered to the National Research Ethics Committee's standards prior to conducting the study and obtained approval from the

relevant government entity to ensure ethical considerations. After explaining the purpose of the study and informing the patients of their right to voluntarily participate and to withdraw at any time, written informed consent was obtained from the participants.

The Setting of The Study:

The study is conducted at Al-Najaf Al-Ashraf Governorate Al-Najaf Al-Ashraf Health Directorate, Al-Sadder Medical City, and the Specialized Center for Kidney Diseases and Transplantation's Hemodialysis Unit.

Study Sample and sampling technique:

A non-probability purposive sample of 40 patients was selected from those who visited the Hemodialysis Unit at the Specialized Center for Kidney Diseases and Transplantation in Al-Najaf Al-Ashraf for the research.

I. Inclusion criteria of study sample:

1. Adult patients aged 18 and above, of both genders, who agreed to participate .
2. Patients with end stage kidney disease undergoing hemodialysis with AVF puncture.
3. Conscious individuals who were able to communicate and accurately rate their pain.

II. Exclusion criteria of study sample :

1. Patients with arteriovenous graft or central venous catheter .
2. Patients with emergency hemodialysis .
3. Children and those under 18 .
4. Patients with mental health issues.

Study Instrument:

An assessment tool used to evaluate the pain intensity among patients undergoing hemodialysis, the tool included 3 parts:

Part I: Patient's Socio-Demographic Characteristics:

It is measured subjectively and includes five variables age, gender, level of education, residence, and BMI contained 2 item height and weight.

Part II: Clinical Data:

It is measured subjectively and include 6 items, the duration of hemodialysis treatment, the number of hemodialysis sessions, the duration of each session, the time of feeling pain, the associated comorbidities and the use of sedatives before the time of hemodialysis

Part III: Pain Intensity:

It consists 1 item , Rating Analogue Scale (RAS) numerical pain intensity scale to evaluate the intensity of pain experienced during the insertion of the needle into the arteriovenous fistula. The scale will range from 0 (no pain) to 10 (worst imaginable pain). panel experts (10 experts) within the specialty of Nursing and Medicine were consulted in order to assess the validity of the tool, and they agreed to the questionnaire, and some suggested some amendments and additions, all of which were taken into consideration.

Since the pain scale intensity is a global scale, and there is no modification suggested by the experts. Therefore, the reliability of the scale is not estimated.

Data Collection

The data collection for this study will involve a survey questionnaire administered to 40 hemodialysis patients. The survey questionnaire will contain three parts: demographic-social data, clinical data, and a numerical pain intensity scale. All participants will be asked to complete the survey questionnaire to assess the intensity of pain experienced during the insertion of the needle into the arteriovenous fistula without any intervention.

The survey questionnaire will be administered to all study participants in a single group. Data will be collected in a single session, and the survey should take no more than 15 minutes to complete. The collected data will be used to describe the intensity of pain experienced by the participants during the insertion of the needle into the arteriovenous fistula without any intervention.

Statistical Analysis:

After the data are prepared for statical analysis, the descriptive and inferential statistics employ for data analysis using the Statical Package of the Social Sciences (SPSS), version (IBM 22) as follows:

Descriptive statistics:

- Frequency and percentage tables.
- Mean and standard deviation.

Study Limitations:

The use of a purposive sampling method from a single hospital setting could introduce selection bias and limit the generalizability of the findings.

DISCUSSION:

On average, patients with chronic renal failure complain of moderate pain during the hemodialysis process . Patients with chronic renal failure are often committed to hemodialysis for life, and each time a puncture is made for an arteriovenous fistula (Back&Lee,2020).The results of the research study revealed that the study sample experienced moderate to severe pain during the procedure.

Pain associated with AV access is a distinctive form of pain that can be anticipated in all hemodialysis (HD) patients since vascular access is essential for HD procedures. Among various methods of achieving vascular access, arteriovenous fistula (AVF) is considered the most effective and efficient (Aitken et al., 2013).

However, when HD is performed three times a week using AVF, patients are repeatedly exposed to the stress and pain caused by approximately 300 needle punctures per year. Achieving and maintaining adequate blood flow often necessitates multiple cannulation attempts, resulting in bruising and pain, particularly in patients with recently created fistulas. Additionally, larger needles are required to attain the necessary dialysis flow rate, further contributing to discomfort and potential bruising (Ibrahim et al.,2022).

Assessing the pain experienced during AVF cannulation is crucial for nursing professionals. This aspect deserves primary attention as it can be a significant stress source for patients who rely on AVF for vascular access. The fear of needles and the pain associated with cannulation can often lead to discomfort and anxiety(Tomás et al., 2014). In a systematic review conducted in 2016 that collected 52 studies, the incidence of acute and chronic pain among hemodialysis (HD) patients reached as high as 82% and 92%, respectively. A significant proportion of patients experienced severe pain. Studies have highlighted different sources and locations of pain, with the majority focusing on general pain, pain associated with arteriovenous access, headaches, and musculoskeletal pain. Other studies examined the prevalence and/or severity of pain associated with AV access. The predominant approach employed in the reviewed studies was observational, with only two studies adopting an interventional design and providing baseline pain intensity data. The investigation focused on examining the occurrence of acute pain, chronic pain, or both, yielding prevalence rates ranging from 12% to 80.2%. However, the reporting of pain severity was not consistently documented across all studies. Various pain assessment scales were utilized, encompassing the McGill Pain Questionnaire (MPQ), Visual Analog Scale (VAS), Brief Pain Inventory, Pain Management Index (PMI), and Numeric Rating Scale. However, only two of these studies provided specific information regarding the type of AV access used. In one of these studies, it was observed that the rope-ladder cannulation resulted a higher trend of severe pain (27.7%). And in other study, some patients had rope-ladder cannulation of AVF, but some also had a graft, they use numeric rating scale NRS to assess AV access pain and found the prevalence of pain 57.5 % and pain intensity result from Low pain 79%, Moderate 13%, and Severe 8% (Brkovic et al, 2016).

CONCLUSIONS, RECOMMENDATIONS & Nursing Implications:

This study showed that arteriovenous fistula puncture among hemodialysis patients is associated with moderate to severe pain. The findings of this study demonstrate the need for further research to identify interventions which could help to reduce the pain experienced during the procedure. Additionally, healthcare professionals should be aware of the potential for pain associated with this procedure and should provide adequate pain management and education to patients.

It is important to note that pain management strategies should be employed in order to minimize the pain experienced by dialysis patients during this procedure. Such strategies may include the use of local anesthetics or other medications, which can help to reduce the intensity of the pain. In addition, further research should be conducted in order to better understand the factors that contribute to the pain experienced by dialysis patients during arteriovenous fistula punctures, as well as to develop more effective pain management strategies.

The current study focusing on the evaluation of pain intensity related to arteriovenous fistula puncture among hemodialysis patients has several nursing implications that can guide clinical practice and enhance patient care. Here are some nursing implications based on the findings of the study:

- Assessment and Monitoring: Prioritize regular pain assessment before, during, and after arteriovenous fistula puncture using standardized tools. Tracking pain intensity over time helps tailor interventions.
- Individualized Plans: Collaborate with patients to create personalized pain management plans considering their unique pain experience, thresholds, preferences, and health conditions.
- Non-Pharmacological Techniques: Educate patients about non-drug methods like distraction, relaxation, deep breathing, and imagery. Empower patients to actively engage in their pain management.
- Research and Education: Recognize the study's call for further research on pain reduction during arteriovenous fistula puncture. Nurses should contribute through participation in research and staying updated on evidence-based practices.

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Results:

Table (1): Study sample Demographic Characteristics

Demographic Characteristics	Rating And Intervals	Statistics	Study Sample
Age / years	20-29	Freq.	8
		Percentage	20.0%
	30 – 39	Freq.	11
		Percentage	27.5%
	40 – 49	Freq.	7
		Percentage	17.5%
	50 – 59	Freq.	8
		Percentage	20.0%
	60 and more	Freq.	6
		Percentage	15.0%
Mean (Std. dev.)			46.6 (15.3)
Total		Freq.	40
		Percentage	100.0%
Gender	Male	Freq.	21
		Percentage	52.5%
	Female	Freq.	19
		Percentage	47.5%

Total		Freq.	40
		Percentage	100.0%
Educational level	Illiterate	Freq.	8
		Percentage	20.0%
	Primary school	Freq.	23
		Percentage	57.5%
	Secondary school	Freq.	8
		Percentage	20.0%
	Diploma	Freq.	0
		Percentage	0.0%
	Bachelor's	Freq.	1
		Percentage	2.5%
Total		Freq.	40
		Percentage	100.0%
Residence	Urban	Freq.	27
		Percentage	67.5%
	Rural	Freq.	13
		Percentage	32.5%
Total		Freq.	40
		Percentage	100.0%

Table (1) showed that The largest age group in the study sample was 30-39 (27.5%). Males had the highest percentage in the study sample (52.2%). Primary school had the highest educational level in the study sample (57.5%). Urban residence was the highest in the study sample (67.5%)..

Table (2): Distribution of the Study Sample according to their Body Mass Index

Body Mass Index Levels	Statistics	Study Sample
Underweight	Freq.	2
	Percentage	5.0%
Normal	Freq.	28
	Percentage	70.0%
Obese	Freq.	2
	Percentage	5.0%
Overweight	Freq.	8
	Percentage	20.0%
Overall Mean		23.3
Total	**Freq.**	**40**
	Percentage	**100.0%**

Table (2) shows that the highest percentage of BMI is the normal limit 70 % for study sample.05.

Table (3): Study sample Clinical Characteristics

Clinical Characteristics	Rating and Intervals	Statistics	Study Sample
Duration of Dialysis Treatment / years	Less Than One Year	Freq.	6
		Percentage	15.0%
	1-2	Freq.	8
		Percentage	20.0%
	3-4	Freq.	2
		Percentage	5.0%
	5-6	Freq.	3
		Percentage	7.5%
	7 and more	Freq.	21
		Percentage	52.5%
Total		Freq.	40
		Percentage	100.0%
Number of Dialysis Sessions / week	1	Freq.	0
		Percentage	0.0%
	2	Freq.	34
		Percentage	85.0%
	3	Freq.	6
		Percentage	15.0%
Total		Freq.	40
		Percentage	100.0%
How long is the Hemodialysis session? / Hours	3	Freq.	7
		Percentage	17.5%
	4	Freq.	33
		Percentage	82.5%
Total		Freq.	40
		Percentage	100.0%
When do you feel pain related AVF puncture ?	Through AVF	Freq.	40
		Percentage	100.0%
Total		Freq.	40
		Percentage	100.0%
Associated Comorbidities	None	Freq.	11
		Percentage	27.5%
	Diabetes mellitus	Freq.	1
		Percentage	2.5%
	Diabetes mellitus +Hypertension	Freq.	5
		Percentage	12.5%
	Systemic Lupus Erythematous + Hypertension	Freq.	1
		Percentage	2.5%
	Hypertension	Freq.	22
		Percentage	55.0%
Total		Freq.	40
		Percentage	100.0%
Sedation drugs taken at time of dialysis	Yes	Freq.	6
		Percentage	15.0%

	No	Freq.	34
		Percentage	85.0%
Total		Freq.	40
		Percentage	100.0%

Table (3) shows the clinical features of study group had 52.5% of patients with dialysis duration of 7 years or more, 85% of patients with 2 sessions/week frequency of dialysis, 82.5 % of patients with 4 hours duration of dialysis session, 85% of patients with 100% of pain through AVF, and 55% of patients with hypertension as the highest comorbidity.

Table (4): Assessment of Pain Intensity in the Study sample

Pain intensity levels	Statistics	Study Sample
None	Freq.	0
	Percentage	0.0%
Mild	Freq.	0
	Percentage	0.0%
Moderate	Freq.	33
	Percentage	82.5%
Sever	Freq.	7
	Percentage	17.5%
Overall Mean		6.0
Total	**Freq.**	**40**
	Percentage	**100.0%**

Table (4) shows that there is 82.5 % of study sample present with moderate pain and 17.5% with severe pain.