



The Relationship Between Anxiety Levels and the Intensity of Pain from AV Shunt Punctures in Patients Undergoing Hemodialysis in Tegal

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Abstract

The study examined the relationship between anxiety levels and pain intensity during AV shunt cannulation among patients undergoing hemodialysis at RSUI Harapan Anda Tegal. A quantitative correlational study with a cross-sectional approach was conducted among 103 patients selected through purposive sampling. Anxiety was assessed using the Hamilton Anxiety Rating Scale (HARS), while pain intensity during AV shunt cannulation was measured using the Numeric Rating Scale (NRS), with the relationship between variables analyzed using the Spearman Rank test. The findings showed that 71 respondents (68.9%) experienced moderate anxiety, while 32 respondents (31.1%) experienced mild anxiety. Regarding pain intensity, 72 respondents (69.9%) reported moderate pain, 30 respondents (29.1%) reported mild pain, and 1 respondent (1.0%) reported severe pain during AV shunt cannulation. Spearman Rank analysis demonstrated a very strong, positive, and statistically significant relationship between anxiety level and AV shunt puncture pain intensity, with a correlation coefficient of $Rho = 0.938$ and $p = 0.000$. The positive correlation indicates that patients with higher anxiety levels tended to experience greater pain intensity during AV shunt cannulation. These findings highlight the importance of integrating psychological assessment with pain assessment in routine hemodialysis care. Early identification of anxiety and appropriate anxiety-management strategies may support individualized nursing interventions and improve patient comfort during repeated AV shunt cannulation.

Keywords: Anxiety, AV shunt, Hemodialysis, Pain Intensity, Puncture.



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INTRODUCTION

Hemodialysis remains the most widely used renal replacement therapy for patients with advanced chronic kidney disease and kidney failure, functioning as a life-sustaining treatment when the kidneys can no longer adequately remove metabolic waste, toxins, and excess fluid from the body (Ministry of Health of the Republic of Indonesia, 2023). The growing emphasis on long-term management of chronic kidney disease has positioned hemodialysis not merely as an isolated medical procedure but as a recurrent therapeutic process requiring sustained attention to patients' physical comfort, psychological condition, and ability to tolerate repeated invasive procedures. Patients undergoing hemodialysis are required to attend treatment regularly and repeatedly, meaning that discomfort associated with vascular access can accumulate as part of their continuing treatment experience. Contemporary dialysis practice continues to regard vascular access as a central determinant of treatment continuity because adequate blood flow, durability, and low complication risk are essential for effective dialysis delivery (Daugirdas, Blake, & Ing, 2021). Arteriovenous fistula (AV fistula/AV shunt), particularly the native fistula, is generally preferred because of its favorable durability and comparatively lower infection risk than several alternative vascular access modalities (Kidney Disease: Improving Global Outcomes, 2024). The clinical advantage of AV shunt access, however, creates a recurring procedural burden because patients must undergo needle cannulation at every dialysis session, making pain and anticipatory psychological responses clinically relevant components of routine hemodialysis care.

AV shunt puncture is an invasive procedure in which a relatively large needle is inserted into the vascular access to establish the blood circuit required for dialysis, and repeated cannulation can produce both immediate physical discomfort and psychological distress. Evidence from an integrative

review indicates that pain associated with arteriovenous fistula cannulation remains an important problem in hemodialysis care and requires systematic attention rather than being treated as an unavoidable consequence of treatment (Alzaatreh & Abdalrahim, 2020). The repeated nature of puncture distinguishes this pain from many acute procedural experiences because previous unsuccessful, painful, or traumatic cannulations may shape patients' expectations before subsequent procedures. Psychological anticipation can increase vigilance toward bodily sensations, while fear of needles and memories of previous pain may intensify anxiety before the needle is inserted (Sitorus, 2020). Pain itself is a multidimensional sensory and emotional experience whose intensity, quality, duration, and interpretation vary among individuals, indicating that the physical stimulus of cannulation cannot fully explain differences in patients' reported pain levels (Roji, Agustina, & Handian, 2022). Clinical observations and previous studies indicate that pain during AV fistula cannulation remains common among hemodialysis patients, including evidence showing that approximately 57% of patients in Jordan reported pain during needle insertion (Alzaatreh & Abdalrahim, 2020). These findings establish AV shunt puncture as a clinically meaningful problem while also indicating that understanding the psychological determinants of perceived pain is necessary for a more comprehensive approach to hemodialysis nursing care.

The intensity of AV shunt puncture pain is influenced by an interaction of physical, technical, and individual factors, including vascular condition, vessel depth and elasticity, vascular-access complications, needle size, puncture site, insertion angle, and the technical competence of healthcare personnel. Patient-related characteristics such as age, fatigue, general health status, previous experience, coping capacity, and repeated exposure to cannulation may further contribute to differences in pain perception, making pain assessment inherently dependent on more than the mechanical characteristics of needle insertion (Sebayang, 2020). Psychological factors are particularly important because anxiety, fear of needles, and previous painful experiences can modify how patients anticipate, interpret, and respond to nociceptive stimulation during invasive procedures (Sukma, Aminah, & Wahyudin, 2020). Anxiety among hemodialysis patients may emerge from repeated exposure to needles, prolonged treatment sessions, uncertainty regarding disease progression, physical limitations, economic concerns, and fears related to complications or mortality (Dame, Rayasari, Besral, Irawati, & Kurniasih, 2022). Recent evidence also demonstrates that pain and anxiety frequently coexist during AV fistula cannulation, suggesting that psychological responses should be considered alongside procedural characteristics when evaluating patients' experiences of vascular access (Fareed, Saeed, & Ahmed, 2025). At the same time, repeated hemodialysis exposure does not uniformly eliminate anxiety because adaptation, coping mechanisms, family support, and individual perceptions of treatment may produce different psychological responses among patients. The coexistence of these factors makes it necessary to distinguish the independent physical stimulus of puncture from the psychological processes that may amplify or attenuate the subjective intensity of pain.

A growing body of research has examined interventions designed to reduce pain or anxiety during AV fistula cannulation, reflecting increasing recognition that vascular-access discomfort represents a modifiable component of hemodialysis practice rather than an inevitable treatment consequence. Randomized evidence has shown that lavender aromatherapy can influence both AV fistula puncture pain and state and trait anxiety, supporting the relevance of psychological and sensory mechanisms in the cannulation experience (Şahin, Tokgöz, & Demir, 2021). More recent intervention studies have similarly reported improvements in pain and anxiety through approaches such as virtual-reality distraction, music therapy, stress-ball use, guided imagery, and other nursing-based techniques (Elzeky et al., 2024). These studies collectively suggest that pain and anxiety are interconnected clinical outcomes, yet much of the recent literature has concentrated on testing interventions rather than directly clarifying the strength and direction of the relationship between anxiety level and puncture-pain intensity. Evidence concerning anxiety among patients with chronic kidney disease also indicates substantial psychological burden, although anxiety levels may differ according to demographic characteristics, treatment experiences, disease-related concerns, and available psychosocial support (Hafidz et al., 2025). Recent Indonesian evidence has further documented anxiety among patients with kidney failure and AV-shunt access, indicating that psychological vulnerability remains relevant even among individuals accustomed to repeated dialysis procedures (Izzati, 2026). The literature therefore provides a strong basis for considering anxiety as a potential correlate of AV shunt puncture pain, while

leaving an important empirical question regarding how these two variables are associated within a specific hemodialysis population.

The principal gap lies in the limited integration of anxiety assessment and direct measurement of AV shunt puncture pain within the same observational framework, particularly in Indonesian local healthcare settings where patient characteristics, service practices, coping patterns, and procedural experiences may differ from those reported in international studies. Existing intervention research demonstrates that reducing anxiety or distraction during cannulation can alter pain-related outcomes, but intervention effects do not necessarily establish whether naturally occurring differences in anxiety levels are associated with differences in pain intensity among patients receiving routine care. The distinction is important because a statistically meaningful relationship between anxiety and pain would support a broader biopsychological interpretation of cannulation discomfort, whereas a weak relationship would suggest that procedural or physiological factors deserve greater explanatory emphasis. Systematic evidence on nursing interventions for AV fistula insertion pain further confirms the diversity of approaches used to manage discomfort, but also indicates the need for stronger contextual understanding of factors associated with patients' pain experiences (Limaheluw et al., 2026). Research examining anxiety and pain during cannulation has also demonstrated that both outcomes can be simultaneously affected during needle insertion, reinforcing the possibility of a reciprocal relationship that warrants direct assessment rather than inference from intervention studies (Mahdi & Dawood, 2025). In the Indonesian context, evidence concerning hemodialysis patients has frequently emphasized anxiety, quality of life, or general treatment experiences, while the specific association between anxiety intensity and pain intensity during AV shunt puncture remains comparatively underexplored at the local level. This gap is particularly relevant in Tegal, where understanding patients' psychological and pain responses can provide context-specific evidence for improving nursing assessment and individualized management of repeated vascular-access procedures.

The present study is positioned within this gap by examining the relationship between anxiety levels and the intensity of pain experienced during AV shunt puncture among patients undergoing hemodialysis in Tegal. Rather than treating pain solely as a mechanical consequence of needle insertion, the study conceptualizes puncture-related pain as a patient-reported experience that may be associated with psychological conditions occurring before and during a recurrent invasive procedure. The study identifies respondent characteristics, assesses anxiety levels, measures the intensity of AV shunt puncture pain, and statistically examines the relationship between the two principal variables. This approach provides empirical evidence from a local hemodialysis population while connecting psychological assessment with a concrete procedural outcome that is directly relevant to nursing practice. The findings are expected to strengthen the theoretical understanding of the interaction between psychological state and perceived procedural pain in recurrent renal replacement therapy and to provide a methodological basis for integrating anxiety and pain assessment within routine vascular-access care. The ultimate contribution of the study is to clarify whether patients with higher anxiety levels tend to report greater AV shunt puncture pain, thereby supporting more responsive assessment and potentially informing individualized nursing strategies aimed at improving comfort and treatment experience during repeated hemodialysis sessions.

RESEARCH METHODS

This study employed an empirical quantitative approach using a correlational research design with a cross-sectional approach to examine the relationship between anxiety levels and the intensity of pain experienced during AV shunt puncture among patients undergoing hemodialysis. The study population comprised all patients with chronic kidney disease undergoing hemodialysis through an AV shunt at the Hemodialysis Unit of RSU Islam Harapan Anda Tegal, with 103 respondents selected using purposive sampling. Eligible participants were patients undergoing regular hemodialysis with an AV shunt who were able to communicate effectively, were willing to participate, and experienced AV shunt puncture during the data-collection period, whereas patients with conditions that could interfere with anxiety or pain assessment, such as impaired consciousness or inability to provide a reliable response, were excluded. The selection of participants was based on the consideration that repeated vascular-access cannulation constitutes a relevant source of procedural pain and psychological responses among hemodialysis patients (Alzaatreh & Abdalrahim, 2020). Data were collected directly in the Hemodialysis Unit of RSU Islam Harapan Anda Tegal by assessing respondents' anxiety and pain

associated with AV shunt puncture during the hemodialysis procedure. The repeated nature of vascular-access cannulation and its potential psychological burden provided the clinical context for examining anxiety and pain as related patient-reported outcomes (Fareed, Saeed, & Ahmed, 2025).

The research instruments consisted of the Hamilton Anxiety Rating Scale (HARS) to assess respondents' anxiety levels and the Numeric Rating Scale (NRS) to measure the intensity of pain experienced during AV shunt puncture. Anxiety was treated as the independent variable, whereas AV shunt puncture pain intensity was treated as the dependent variable, allowing the analysis to focus specifically on the association between psychological response and procedural pain. The use of structured anxiety and pain measurements is consistent with previous hemodialysis research examining anxiety and pain during AV fistula cannulation (Mahdi & Dawood, 2025). Descriptive analysis was performed to summarize respondent characteristics, anxiety levels, and pain intensity, while bivariate analysis was conducted using the Spearman Rank correlation test because the analysis focused on the association between ordinal measurements of anxiety and pain. The use of standardized pain assessment is relevant to AV fistula cannulation research because pain intensity represents a subjective outcome that should be systematically measured rather than inferred solely from procedural characteristics (Limaheluw et al., 2026). Ethical principles were applied throughout the research process by providing participants with information regarding the study, obtaining informed consent before data collection, maintaining confidentiality and anonymity, and ensuring that participation was voluntary without affecting the patients' ongoing hemodialysis care.

RESULTS AND DISCUSSION

Respondent Characteristics

The characteristics of the 103 respondents provide an important context for interpreting anxiety levels and pain intensity associated with AV shunt puncture during hemodialysis. The age distribution shows that most respondents were 36–55 years old, accounting for 51 respondents (49.5%), followed by those aged >56 years with 40 respondents (38.8%), while only 12 respondents (11.7%) were aged 18–35 years. This distribution indicates that the study population was predominantly composed of middle-aged and older adults who had undergone long-term treatment for chronic kidney disease. The concentration of respondents in these age groups is clinically relevant because aging may be accompanied by changes in physical condition, vascular characteristics, and adaptation to repeated hemodialysis procedures. Daugirdas et al. (2021) explain that vascular access management in long-term hemodialysis requires attention to patient characteristics and access-site conditions because repeated cannulation can affect treatment comfort. The predominance of middle-aged and older respondents therefore provides an important demographic context for understanding their responses to repeated AV shunt puncture.

Table 1. Respondent Characteristics

Characteristics	Category	Frequency (n)	Percentage (%)
Age	18–35 years	12	11.7
	36–55 years	51	49.5
	>56 years	40	38.8
Gender	Male	65	63.1
	Female	38	36.9
Education	Elementary School	29	28.2
	Junior High School	17	16.5
	Senior High School	47	45.6
	Diploma	3	2.9
	Bachelor's Degree	7	6.8
Duration of Hemodialysis	3–12 months	5	4.9
	13–36 months	59	57.3
	>36 months	39	37.9
Total		103	100

The gender distribution shows that male respondents constituted the larger proportion of the sample, with 65 respondents (63.1%), while female respondents accounted for 38 respondents (36.9%). This distribution indicates that the study population was predominantly male, although the descriptive data alone do not establish gender as a determinant of anxiety or AV shunt puncture pain. Differences in responses to repeated invasive procedures may instead reflect the interaction of physical condition, previous treatment experiences, psychological adaptation, and individual coping mechanisms. The gender composition nevertheless forms an important part of the demographic profile because patient characteristics can influence experiences during prolonged hemodialysis treatment. Asih et al. (2022) reported that patients undergoing hemodialysis experience various changes in quality of life associated with the demands of chronic treatment. The predominance of male respondents should therefore be interpreted as a characteristic of the study sample rather than as evidence of a gender-specific difference in anxiety or pain.

Educational characteristics showed that 47 respondents (45.6%) had completed senior high school, followed by 29 respondents (28.2%) with elementary school education and 17 respondents (16.5%) with junior high school education. Only 3 respondents (2.9%) had a diploma qualification and 7 respondents (6.8%) had completed a bachelor's degree. This distribution indicates that almost half of the respondents had a senior high school educational background, while a considerable proportion had elementary or junior high school education. Educational attainment may influence how patients understand information concerning vascular access, hemodialysis procedures, pain, and anxiety management. Kurniyati et al. (2022) emphasized that patient characteristics are relevant to the process of receiving information and informed consent regarding AV shunt procedures in hemodialysis units. Effective communication is therefore important across educational groups so that patients can understand the procedure, anticipate the treatment process, and communicate their physical and psychological responses appropriately.

The duration of hemodialysis indicates that most respondents had undergone treatment for 13–36 months, comprising 59 respondents (57.3%), followed by 39 respondents (37.9%) who had undergone treatment for more than 36 months, while only 5 respondents (4.9%) had received hemodialysis for 3–12 months. The high proportion of respondents with more than one year of treatment indicates that most participants had experienced repeated AV shunt punctures over an extended period. Repeated exposure may increase familiarity with the procedure and facilitate adaptation, but it does not necessarily eliminate anxiety or pain because each cannulation episode remains an invasive procedure. Kallenbach (2020) notes that vascular access procedures are a routine but important component of maintenance hemodialysis and require appropriate management to maintain access function and patient comfort. This treatment-duration profile is particularly relevant because prolonged exposure to hemodialysis may shape patients' expectations, coping responses, and perceptions of AV shunt puncture.

Taken together, the respondent profile was predominantly characterized by an age of 36–55 years, male gender, senior high school education, and 13–36 months of hemodialysis experience. The concentration of respondents within these categories suggests that most participants were adults who had already undergone a substantial period of adaptation to maintenance hemodialysis. Such characteristics provide an important context for interpreting anxiety and pain because psychological responses to repeated AV shunt puncture may arise from interactions between demographic characteristics, treatment experience, and individual coping mechanisms. Dame et al. (2022) identified several factors associated with anxiety among patients with chronic kidney disease undergoing hemodialysis, indicating that anxiety should be understood within a multifactorial clinical context. The relatively long duration of treatment among most respondents also indicates that anxiety observed in this study cannot simply be attributed to unfamiliarity with hemodialysis. Instead, anxiety may persist despite repeated exposure when patients continue to anticipate discomfort or perceive the puncture procedure as threatening. This condition makes treatment duration an important contextual characteristic when examining the subsequent relationship between anxiety and AV shunt puncture pain.

The characteristics of the respondents also demonstrate that AV shunt puncture was a recurring part of daily treatment for most participants rather than an unfamiliar clinical procedure. The predominance of respondents with 13–36 months and >36 months of hemodialysis experience indicates substantial exposure to repeated vascular access cannulation. Repeated procedures may create

familiarity, but previous painful experiences can also contribute to anticipatory responses before subsequent puncture. Alzaatreh and Abdalrahim (2020) describe AV fistula cannulation as a procedure that can produce pain and discomfort among hemodialysis patients and emphasize the importance of appropriate pain-management strategies. The demographic and treatment-duration pattern in this study therefore establishes a relevant foundation for interpreting the anxiety and pain distributions presented in the following analysis. These characteristics also indicate that the experience of AV shunt puncture should be considered within the broader context of long-term hemodialysis rather than as an isolated procedural event.

Anxiety Level and AV Shunt Puncture Pain

The distribution of anxiety levels among the 103 respondents indicates that moderate anxiety was the predominant condition experienced by patients undergoing hemodialysis with an AV shunt. A total of 71 respondents (68.9%) experienced moderate anxiety, while 32 respondents (31.1%) experienced mild anxiety. No respondents were categorized as having severe or very severe anxiety based on the anxiety assessment used in the study. This distribution suggests that although the respondents had experienced repeated hemodialysis procedures, psychological distress associated with treatment remained present at a moderate level in most participants. Anxiety in hemodialysis patients can arise from repeated invasive procedures, concerns about disease progression, dependence on long-term treatment, and uncertainty regarding health conditions. Dame et al. (2022) reported that patients with chronic kidney disease undergoing hemodialysis may experience anxiety related to various treatment and disease-related factors, indicating that repeated exposure to hemodialysis does not necessarily eliminate psychological distress.

Table 2. Anxiety Level Distribution

Anxiety Level	Frequency (n)	Percentage (%)
Mild	32	31.1
Moderate	71	68.9
Total	103	100

The predominance of moderate anxiety is clinically meaningful because anxiety may influence how patients anticipate and experience invasive procedures such as AV shunt puncture. Patients who experience anxiety may become more attentive to procedural sensations, anticipate pain before needle insertion, and perceive the procedure as more threatening. The repeated nature of vascular access puncture may reinforce this anticipatory response when previous experiences have involved discomfort or difficulty during cannulation. Izzati (2026) similarly described anxiety as an important psychological condition among chronic kidney disease patients with AV shunts receiving hemodialysis. At the same time, the absence of severe and very severe anxiety in the present sample may indicate that most respondents had developed some degree of psychological adaptation to routine hemodialysis. Such adaptation does not necessarily mean that anxiety has disappeared, as the high proportion of moderate anxiety demonstrates that psychological responses remain relevant even among patients with established treatment experience.

The pain distribution showed a pattern similar to that observed for anxiety, with moderate pain being the dominant category among respondents. As presented in Table 3, 72 respondents (69.9%) reported moderate pain, 30 respondents (29.1%) reported mild pain, and only 1 respondent (1.0%) reported severe pain. The findings indicate that AV shunt puncture was generally associated with mild-to-moderate pain, with moderate pain representing the most frequent response. The occurrence of pain is understandable because AV shunt cannulation requires needle insertion into vascular access and is performed repeatedly during hemodialysis sessions. Alzaatreh and Abdalrahim (2020) identify AV fistula cannulation as a procedure that can produce pain and discomfort and emphasize the need for appropriate strategies to manage these experiences. The predominance of moderate pain in this study therefore indicates that procedural discomfort remains a relevant clinical issue even among patients who have undergone hemodialysis for extended periods.

Table 3. AV Shunt Puncture Pain Intensity Distribution

Pain Intensity	Frequency (n)	Percentage (%)
Mild	30	29.1
Moderate	72	69.9
Severe	1	1.0
Total	103	100

The concentration of respondents in the moderate-pain category suggests that repeated AV shunt puncture does not necessarily result in complete habituation to procedural pain. Although patients may become familiar with the technical sequence of cannulation, the sensory experience of needle insertion can remain sufficiently intense to be classified as moderate pain. Pain perception may also vary according to vascular access characteristics, puncture technique, needle insertion, individual sensitivity, and psychological state. Fareed et al. (2025) reported that pain and anxiety are relevant experiences during AV fistula cannulation among patients undergoing hemodialysis, reinforcing the importance of considering both physical and psychological responses during vascular access procedures. The present findings are also consistent with evidence that interventions targeting pain and anxiety during AV fistula puncture can improve the procedural experience. For example, Elzeky et al. (2024) demonstrated the relevance of addressing both pain and anxiety during AV fistula puncture through non-pharmacological intervention. These findings reinforce the clinical importance of identifying the intensity of pain rather than treating AV shunt puncture as a routine procedure that is uniformly tolerated by all patients.

The simultaneous predominance of moderate anxiety and moderate pain provides an important descriptive basis for examining the relationship between the two variables. The findings indicate that most respondents were not in the lowest categories of either psychological distress or procedural discomfort, suggesting that anxiety and pain were both prominent experiences within the study population. This pattern is relevant because anxiety may increase physiological arousal and attentional focus on unpleasant sensations, potentially influencing the subjective perception of pain. Guyton and Hall (2021) explain that emotional and physiological responses can influence the processing and perception of sensory stimuli, providing a physiological basis for understanding interactions between psychological states and pain experiences. In the context of hemodialysis, repeated exposure to needle puncture may further reinforce expectations of discomfort and contribute to anticipatory anxiety. Mahdi and Dawood (2025) also examined pain and anxiety during AV fistula needle insertion and demonstrated the clinical relevance of managing these two experiences concurrently. The descriptive similarity between the anxiety and pain distributions therefore provides a meaningful foundation for the subsequent bivariate analysis of their association.

The findings also demonstrate that anxiety and AV shunt puncture pain should be considered as interconnected components of the patient's procedural experience rather than as isolated outcomes. Moderate anxiety was reported by 68.9% of respondents, while moderate pain was reported by 69.9%, showing that both conditions affected approximately two-thirds of the study population. Although descriptive distributions cannot establish causality, their similar concentration in the moderate category supports further investigation of whether higher anxiety corresponds with greater pain intensity. Recent nursing research has increasingly examined interventions that simultaneously address anxiety and pain during vascular access cannulation, including guided imagery, music therapy, distraction, aromatherapy, and other non-pharmacological approaches (Fatma et al., 2025; Kartika et al., 2026; Şahin et al., 2021). The present descriptive findings therefore provide a clinical rationale for examining the statistical relationship between anxiety level and AV shunt puncture pain intensity. This relationship is particularly important for nursing practice because recognition of anxiety before cannulation may help nurses anticipate patients who are more likely to report greater procedural discomfort.

Relationship Between Anxiety Level and AV Shunt Puncture Pain Intensity

The cross-tabulation of anxiety level and AV shunt puncture pain intensity shows a clear pattern among the 103 respondents. Of the 32 respondents with mild anxiety, 30 respondents experienced mild pain and 2 respondents experienced moderate pain. Among the 71 respondents with moderate anxiety, none reported mild pain, 70 respondents experienced moderate pain, and 1 respondent experienced severe pain. This distribution demonstrates that respondents with mild anxiety were predominantly concentrated in the mild-pain category, whereas respondents with moderate anxiety were concentrated

in the moderate-pain category. The absence of mild pain among respondents with moderate anxiety further indicates a consistent directional pattern between the two variables. Such a pattern suggests that anxiety level may be closely related to the subjective experience of pain during AV shunt puncture.

The relationship observed in the distribution is clinically relevant because AV shunt puncture is a repeated invasive procedure that may generate both physical discomfort and psychological responses. Patients who anticipate needle insertion may experience increased worry, tension, and attention toward the expected painful stimulus. Previous experiences of uncomfortable or painful cannulation can also contribute to anticipatory anxiety during subsequent hemodialysis sessions. Alzaatreh and Abdalrahim (2020) explain that pain associated with AV fistula cannulation is influenced by multiple factors and requires appropriate management to improve patient comfort. The observed concentration of mild anxiety with mild pain and moderate anxiety with moderate pain therefore provides an empirical basis for examining whether the two variables are statistically associated. Spearman Rank correlation analysis was subsequently used to determine the direction and strength of this relationship.

Table 4. Relationship Between Anxiety Level and AV Shunt Puncture Pain Intensity

Anxiety Level	Mild Pain	Moderate Pain	Severe Pain	Total
Mild (14–20)	30	2	0	32
Moderate (21–41)	0	70	1	71
Total	30	72	1	103

The statistical analysis produced a Spearman Rank correlation coefficient of 0.938 with a significance value of 0.000 ($p < 0.05$). The coefficient demonstrates a very strong positive relationship between anxiety level and AV shunt puncture pain intensity among patients undergoing hemodialysis. The positive direction indicates that higher anxiety levels were associated with higher levels of reported pain during AV shunt puncture. The significance value below 0.05 indicates that the observed relationship was statistically significant, resulting in rejection of the null hypothesis and acceptance of the alternative hypothesis. This finding confirms the pattern identified in the cross-tabulation, where respondents with mild anxiety were mainly categorized as experiencing mild pain and those with moderate anxiety were mainly categorized as experiencing moderate pain. Fareed et al. (2025) similarly identified pain and anxiety as important experiences during AV fistula cannulation among hemodialysis patients, supporting the relevance of examining these two responses together.

The very strong correlation suggests that psychological conditions may be closely connected with the subjective perception of pain during vascular access procedures. Anxiety can increase anticipatory attention toward needle insertion and may heighten sensitivity to sensations that would otherwise be perceived as less threatening. Emotional tension may also interact with physiological responses to painful stimuli, potentially increasing the perceived intensity of the procedure. Guyton and Hall (2021) explain that pain perception involves complex sensory and neural processes that can be modulated by higher nervous system activity and emotional states. Within repeated hemodialysis treatment, anticipation of AV shunt puncture may therefore become associated with a heightened psychological response that accompanies the physical stimulus. Mahdi and Dawood (2025) also demonstrated the clinical relevance of simultaneously considering pain and anxiety during needle insertion into AV fistula access among hemodialysis patients. These findings provide a theoretical basis for interpreting the strong positive association identified in the present study.

The present result is also supported by recent studies examining interventions directed at pain and anxiety during AV fistula cannulation. Elzeky et al. (2024) demonstrated the relevance of virtual reality distraction for reducing pain and anxiety during AV fistula puncture among hemodialysis patients. Şahin et al. (2021) found that lavender aromatherapy influenced both AV fistula puncture pain and state and trait anxiety, while Fatma et al. (2025) reported the potential benefits of combined music therapy and stress-ball intervention for pain during vascular access cannulation. These findings suggest that pain during vascular access procedures cannot be viewed exclusively as a physical response to needle insertion. Psychological preparation and anxiety management may form an important component of comprehensive nursing care for patients undergoing repeated cannulation. The present study adds to this evidence by demonstrating a naturally occurring statistical association between anxiety level and puncture pain intensity rather than evaluating only the effectiveness of a specific intervention.

Although the correlation coefficient was very strong, the result should be interpreted as an association rather than as evidence of a direct causal effect of anxiety on pain. The cross-sectional design captures anxiety and pain within the same period and cannot establish whether anxiety precedes pain, pain increases anxiety, or both responses reinforce each other over repeated treatment experiences. Other factors, including previous painful cannulation, vascular access condition, puncture technique, individual pain sensitivity, coping mechanisms, and healthcare-provider factors, may also contribute to pain intensity. Limaheluw et al. (2026) emphasized that management of AV fistula insertion pain requires appropriate nursing interventions because procedural pain is influenced by multiple clinical and patient-related factors. Nevertheless, the strength and statistical significance of the observed relationship indicate that anxiety deserves attention when nurses assess patients before AV shunt puncture. Anxiety assessment can help identify patients who may require additional explanation, psychological preparation, relaxation, distraction, or other non-pharmacological approaches before cannulation. This approach may support more patient-centered hemodialysis care by addressing psychological and physical dimensions of the puncture experience simultaneously.

Clinical Implications of Anxiety–Pain Association in Hemodialysis Care

The strong relationship between anxiety and AV shunt puncture pain intensity has important implications for nursing assessment in hemodialysis care. Anxiety should be assessed before vascular access cannulation because psychological distress may influence how patients anticipate and perceive the puncture procedure. The predominance of moderate anxiety in this study indicates that psychological assessment should not be limited to patients who visibly demonstrate severe distress. A structured assessment can help nurses identify patients who require additional preparation before needle insertion and distinguish routine procedural concerns from more substantial anxiety. Dame et al. (2022) identified several factors associated with anxiety among patients undergoing hemodialysis, supporting the need for systematic attention to psychological conditions during routine treatment. Assessment can be complemented by direct communication regarding previous puncture experiences, anticipated pain, and concerns about the vascular access procedure. Integrating anxiety assessment into routine nursing practice may therefore provide an early basis for individualized pain-prevention and anxiety-management strategies.

The findings also emphasize the importance of improving the quality of AV shunt puncture procedures to minimize avoidable discomfort. Nurses play a central role in vascular access management because the technique, preparation, needle insertion, and communication surrounding cannulation can influence the patient's procedural experience. Patients with elevated anxiety may benefit from clear explanations about the procedure, predictable communication, and reassurance before needle insertion. Alzaatreh and Abdalrahim (2020) emphasize the importance of appropriate pain-management strategies for discomfort associated with AV fistula cannulation. Technical competence should therefore be accompanied by an understanding of the psychological responses that may occur before and during puncture. Careful assessment of the access site, appropriate puncture technique, and efforts to minimize repeated unsuccessful attempts can also support patient comfort. A patient-centered approach that combines technical accuracy with psychological preparation may reduce the overall burden associated with repeated AV shunt puncture.

Non-pharmacological interventions represent another relevant clinical implication of the anxiety–pain association identified in this study. Relaxation, distraction, sensory stimulation, and other psychological approaches may help patients manage anticipatory anxiety and reduce attention toward painful stimuli during cannulation. Recent evidence has examined several approaches, including virtual reality distraction, lavender aromatherapy, music therapy, stress-ball use, and guided imagery, in the context of vascular access procedures. Elzeky et al. (2024) reported the relevance of virtual reality distraction for managing pain and anxiety during AV fistula puncture, while Şahin et al. (2021) demonstrated effects of lavender aromatherapy on puncture pain and anxiety. Fatma et al. (2025) also found potential benefits from combining music therapy and stress-ball intervention for pain during vascular access cannulation. Kartika et al. (2026) further demonstrated the relevance of guided imagery therapy for AV fistula cannulation pain among hemodialysis patients. These findings indicate that nursing management can incorporate feasible non-pharmacological strategies alongside standard vascular access procedures to address both psychological and sensory aspects of the patient's experience.

Patient-centered communication is particularly important when managing anxiety and pain during repeated hemodialysis procedures. Nurses can provide information before puncture, allow patients to communicate discomfort, and recognize individual preferences regarding coping strategies during cannulation. Such communication may strengthen patients' sense of control and reduce uncertainty surrounding a procedure that they experience repeatedly. Kurniyati et al. (2022) highlighted the importance of patient characteristics and adequate information in the context of informed consent for AV shunt procedures. Effective communication should therefore be adapted to the patient's educational background, previous treatment experience, and ability to understand procedural information. Patients with longer treatment histories should not automatically be assumed to have minimal anxiety because familiarity with hemodialysis does not eliminate the possibility of procedural apprehension. Consistent communication and individualized support may help nurses establish a therapeutic environment in which patients feel more prepared to undergo AV shunt puncture.

The findings also have implications for the broader nursing management of patients receiving long-term hemodialysis. The very strong positive association between anxiety and puncture pain indicates that psychological assessment can be considered alongside routine physiological and vascular access assessment. Pain management should not focus exclusively on the mechanical aspects of needle insertion because the patient's emotional condition may be closely related to the intensity of the reported experience. Limaheluw et al. (2026) emphasized the role of nursing interventions in managing AV fistula insertion pain among patients with end-stage renal failure undergoing hemodialysis. Nurses can use the assessment results to identify patients who may benefit from additional preparation, relaxation techniques, distraction, or other individualized interventions before cannulation. Regular evaluation of pain and anxiety may also help determine whether selected interventions are providing meaningful benefits across repeated treatment sessions. This integrated approach is consistent with comprehensive nursing care that recognizes physical, psychological, and behavioral dimensions of the hemodialysis experience.

From a theoretical perspective, the findings strengthen the view that procedural pain in hemodialysis should be understood as an experience influenced by both sensory and psychological processes. The strong correlation between anxiety and pain intensity provides empirical support for considering emotional responses when interpreting patients' reports of AV shunt puncture pain. Guyton and Hall (2021) describe pain perception as a complex process involving sensory pathways and modulation by higher nervous system mechanisms, which helps explain why psychological conditions can influence subjective pain experiences. From a methodological perspective, the use of standardized anxiety and pain measures together with Spearman Rank correlation enabled the study to quantify the direction and strength of the observed association. However, the cross-sectional design limits interpretation to an association and does not establish a causal pathway between anxiety and pain. Future studies could use longitudinal or experimental designs to examine whether targeted anxiety-reduction interventions produce corresponding changes in AV shunt puncture pain. The present findings nevertheless provide a practical foundation for strengthening anxiety screening and individualized pain management within routine hemodialysis nursing care.

CONCLUSION

The findings indicate that moderate anxiety was the predominant anxiety level among patients undergoing hemodialysis with an AV shunt, accounting for 71 of the 103 respondents (68.9%). Meanwhile, 32 respondents (31.1%) experienced mild anxiety, indicating that psychological distress remained present among patients despite their repeated exposure to routine hemodialysis procedures. The intensity of AV shunt puncture pain was also predominantly classified as moderate, reported by 72 respondents (69.9%), while 30 respondents (29.1%) experienced mild pain and only 1 respondent (1.0%) experienced severe pain. These findings demonstrate that moderate anxiety and moderate procedural pain were the most common conditions experienced by patients during AV shunt puncture in the hemodialysis unit. The persistence of these responses among patients with established hemodialysis experience highlights that familiarity with repeated treatment does not necessarily eliminate psychological distress or procedural discomfort. Assessment of anxiety and pain should therefore be incorporated into routine nursing care to identify patients who may require additional psychological preparation and individualized support before AV shunt puncture. Appropriate

management of these two conditions may contribute to improving patient comfort and strengthening the quality of patient-centered care throughout the hemodialysis process.

The statistical analysis demonstrated a very strong, positive, and statistically significant relationship between anxiety level and AV shunt puncture pain intensity, with a Spearman Rank correlation coefficient of $Rho = 0.938$ and a significance value of $p = 0.000$ ($p < 0.05$). The positive direction of the correlation indicates that patients with higher levels of anxiety tended to report greater pain intensity during AV shunt puncture. The very strong correlation coefficient further demonstrates that the association between psychological distress and perceived procedural pain was particularly pronounced within the study population. These findings support the view that AV shunt puncture pain should not be understood solely as a physical response to needle insertion, because the patient's psychological condition may also be closely associated with the intensity of the pain experienced. Nursing care should consequently integrate anxiety assessment with pain assessment, therapeutic communication, adequate procedural preparation, and appropriate non-pharmacological strategies before and during vascular access puncture. Although the cross-sectional design does not allow the findings to be interpreted as evidence of a causal relationship, the strength and statistical significance of the association provide an important clinical basis for paying greater attention to anxiety as part of comprehensive pain management in hemodialysis patients. Future studies using longitudinal or experimental designs are recommended to examine the causal pathways between anxiety and AV shunt puncture pain and to determine whether targeted anxiety-management interventions can effectively reduce pain intensity during repeated hemodialysis procedures.

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