

Correlation of Anxiety Level to Cimino Puncture Pain Intensity in Patients Undergoing Regular Hemodialysis

Marthalena Siahaan¹, Eka Isranil Laily², Donisman Bu'ulolo³, Murni Aritonang⁴

^{1,3}Institut Kesehatan Sumatera Utara, Medan, Indonesia

^{2,4}Universitas Prima Indonesia, Medan, Indonesia

**Corresponding Author: marthalena.siahaan@inkessumut.ac.id*

ABSTRACT

Patients with chronic kidney failure who undergo regular hemodialysis experience repeated cannulation of the arteriovenous fistula (Cimino), which produces pain arising not only from the physical trauma of needle insertion but also from the patient's psychological state, particularly anxiety. This study aimed to analyze the correlation between anxiety level and pain intensity during Cimino puncture among regular hemodialysis patients at a hospital in Medan, Indonesia. A quantitative correlational design with a cross-sectional approach was used. Thirty-three respondents were recruited through purposive sampling. Anxiety was measured using the Hamilton Rating Scale for Anxiety (HRS-A), while pain intensity was assessed with the Numeric Rating Scale (NRS). Data were analyzed using the Spearman Rank correlation test. Most respondents experienced mild anxiety (78.8%), and pain intensity was predominantly moderate (57.6%). The Spearman Rank test showed a strong, statistically significant positive correlation between anxiety level and pain intensity ($r = 0.590$; $p = 0.000$; $p < 0.05$), indicating that higher anxiety was associated with greater pain during Cimino puncture. These findings confirm that psychological factors contribute meaningfully to the pain experienced during invasive hemodialysis procedures. Hemodialysis nurses are recommended to conduct routine anxiety assessment before Cimino cannulation and to apply non-pharmacological interventions, such as distraction and relaxation techniques, to reduce both anxiety and pain during the procedure.

Keywords: anxiety; puncture pain; cimino; hemodialysis; arteriovenous fistula

INTRODUCTION

The number of patients with chronic kidney failure continues to rise every year, both globally and in Indonesia. The Indonesian Nephrology Association (Pernefri) recorded a cumulative total of 60,526 patients undergoing dialysis in 2023, with an overall prevalence of 127,900 cases. In the same period, the Social Security Agency for Health (BPJS Kesehatan) reported 134,057 patients with chronic kidney failure receiving hemodialysis in 2024. The Indonesian Renal Registry (IRR) further documented 1,526,022 Cimino fistulas implanted in patients as of 2023, a figure expected to keep rising in line with the growing population of chronic kidney failure patients nationwide.

Hemodialysis can only be performed once adequate vascular access is available, most commonly through a Cimino arteriovenous fistula. Cimino puncture inevitably causes pain, since the mechanical stimulation of needle insertion into the skin and blood vessels activates nociceptors and triggers a pain response. Repeated punctures over time can also heighten the sensitivity of both peripheral and central nerve pathways, lowering the patient's pain threshold so that even a stimulus of the same intensity is perceived as more painful (Black & Hawks, 2021).

Psychological factors, particularly anxiety, also shape how patients experience pain during Cimino puncture. Anxiety can amplify the body's response to pain by heightening nerve activity, increasing muscle tension, and narrowing the patient's attention toward the painful stimulus. Patients with higher anxiety levels therefore tend to perceive pain more intensely than those who are calmer (Kaban et al., 2025).

This relationship is reciprocal: persistent pain can heighten a patient's anxiety, while anxiety, in turn, can intensify pain perception through physiological and psychological pathways such as increased muscle tension, altered nervous system activity, and heightened attentional focus on the painful stimulus (Potter & Perry, 2016; Bahrudin, 2017). Long-term hemodialysis therapy also carries a considerable psychological burden, contributing to elevated anxiety and reduced psychological well-being among patients. Comparable findings from hemodialysis units elsewhere in Indonesia indicate a significant association between anxiety level and pain intensity during vascular access procedures (Agustin, dkk, 2020). Continued therapy promotes better patient adaptation and reduces anxiety, allowing the family to provide ongoing support and encouragement (Soemah & Adiwibowo, 2022).

Despite this body of evidence, the interaction between anxiety and pain specifically during Cimino puncture remains insufficiently examined in the local hemodialysis setting. Left unmanaged, this pain–anxiety cycle may compromise patient comfort, quality of life, and adherence to long-term hemodialysis therapy (Suparti, 2019). This study therefore aimed to analyze the correlation between anxiety level and pain intensity during Cimino puncture among patients with chronic kidney failure undergoing regular hemodialysis at a hospital in Medan, Indonesia.

METHODS

This study used a quantitative approach with a correlational design and a cross-sectional method. It was conducted in the Hemodialysis Unit of Adventist Hospital, Medan. Respondents

were selected using purposive sampling based on predetermined inclusion and exclusion criteria, yielding a final sample of 33 patients undergoing regular hemodialysis.

Anxiety level was measured using the Hamilton Rating Scale for Anxiety (HRS-A), a 14-item instrument that assesses subjective emotional responses such as worry, tension, and fear experienced prior to fistula (Cimino) needle insertion; respondents completed this instrument while preparing for and awaiting their turn for hemodialysis. Pain intensity during Cimino puncture was measured using the Numeric Rating Scale (NRS), on which respondents rated their pain as mild (score 1–3), moderate (score 4–6), or severe (score 7–10).

Data were analyzed using univariate and bivariate analysis. Univariate analysis was performed descriptively to determine the frequency distribution of each variable, while bivariate analysis used the Spearman Rank correlation test to examine the relationship between anxiety level and pain intensity during Cimino puncture.

Ethical principles were upheld throughout data collection. Written informed consent was obtained from all respondents prior to participation, and the confidentiality of respondent data was maintained throughout the research process.

RESULTS

Respondent Characteristics

Of the 33 respondents, the majority were male (66.7%), in the elderly age group of 57–74 years (72.7%), had completed senior high school or an equivalent level of education (60.6%), were self-employed or worked in the private sector (57.6%), and had undergone regular hemodialysis for 3–4 years (51.5%). The complete distribution is presented in Table 1.

Table 1. Frequency Distribution of Respondent Characteristics

Characteristics	f	%
Gender		
Male	22	66.7
Female	11	33.3
Age		
Middle age (40–56 years)	9	27.3
Elderly (57–74 years)	24	72.7
Education		
Elementary school	2	6.1
Junior high school	6	18.2
Senior high school / equivalent	20	60.6
Diploma III / Bachelor's degree	5	15.2

Characteristics	f	%
Occupation		
Housewife	8	24.2
Self-employed / private sector	19	57.6
Government employee	6	18.2
Duration of Hemodialysis		
1–2 years	5	15.2
3–4 years	17	51.5
5–6 years	10	30.3
7–8 years	1	3.0

Respondents' Anxiety Level

Most respondents experienced mild anxiety prior to Cimino puncture (78.8%), while the remainder experienced moderate anxiety (21.2%); no respondents reported no anxiety or severe anxiety. Details are shown in Table 2.

Table 2. Frequency Distribution of Respondents' Anxiety Level

Anxiety Level	f	%
No anxiety (0–11)	0	0.0
Mild anxiety (12–22)	26	78.8
Moderate anxiety (23–33)	7	21.2
Severe anxiety (34–56)	0	0.0
Total	33	100.0

Note: Anxiety level categorized using the Hamilton Rating Scale for Anxiety (HRS-A) score range.

Respondents' Pain Intensity

Most respondents experienced moderate pain during Cimino puncture (57.6%), followed by mild pain (30.3%) and severe pain (12.1%), as shown in Table 3.

Table 3. Frequency Distribution of Respondents' Pain Intensity

Pain Intensity	f	%
No pain (0)	0	0.0
Mild pain (1–3)	10	30.3
Moderate pain (4–6)	19	57.6
Severe pain (7–10)	4	12.1
Total	33	100.0

Note: Pain intensity categorized using the Numeric Rating Scale (NRS).

Relationship between Anxiety Level and Pain Intensity

Cross-tabulation between anxiety level and pain intensity showed that among respondents with mild anxiety, 16 (61.5%) experienced moderate pain and 10 (38.5%) experienced mild pain, with none reporting severe pain. Among respondents with moderate anxiety, 4 (57.1%) experienced severe pain and 3 (42.9%) experienced moderate pain, with none reporting mild pain. Overall, most respondents experienced moderate pain (19 respondents, 57.6%), followed

by mild pain (10 respondents, 30.3%) and severe pain (4 respondents, 12.1%), as presented in Table 4.

Table 4. Correlation between Anxiety Level and Pain Intensity

Anxiety Level	Mild Pain	Moderate Pain	Severe Pain	Total	Sig. (2-tailed)
Mild anxiety	10	16	0	26	0.000
Moderate anxiety	0	3	4	7	
Severe anxiety	0	0	0	0	
Total	10	19	4	33	

This pattern suggests that increased anxiety tends to be accompanied by increased pain intensity. As a cross-tabulation only establishes a descriptive pattern, the Spearman Rank correlation test was subsequently used to determine whether this association was statistically significant.

The Spearman Rank correlation test produced a coefficient of $r = 0.590$ with a significance value of $p = 0.000$ ($p < 0.05$), indicating a statistically significant relationship between anxiety level and Cimino puncture pain intensity among hemodialysis patients. The positive coefficient indicates that higher anxiety in patients tends to be accompanied by greater pain intensity during the procedure.

DISCUSSION

Respondent Characteristics

Respondents undergoing hemodialysis at Adventist Hospital, Medan varied in age, gender, education, and duration of therapy. Most were in the middle-to-older age group, who explained that the prevalence of chronic kidney failure rises with age due to the progressive decline of nephron function. Older patients are also more prone to comorbidities such as hypertension and diabetes mellitus, both major risk factors for chronic kidney failure (American Diabetes Association, 2023). The predominance of male respondents aligns with Black and Hawks (2021), who noted that lifestyle factors more common among men, such as smoking and an unhealthy diet, contribute substantially to vascular damage in the kidneys. Regarding duration of hemodialysis, most respondents had undergone therapy for approximately three to four years; according to Nursalam (2018), long-term therapy requires patients to continuously adapt to hospital routines, a process that can affect their psychosocial well-being over time. Taken together, these characteristics suggest that the natural decline in nephron function with age, the

accumulation of comorbidities, and lifestyle-related risk factors among men jointly explain the demographic profile observed in this study.

Anxiety Level in Patients Undergoing Hemodialysis

Most respondents experienced mild-to-moderate anxiety, indicating that hemodialysis continues to elicit a psychological response even among patients accustomed to routine therapy. Anxiety in hemodialysis patients can stem from several sources, including dependence on the hemodialysis machine, lifestyle changes, dietary restrictions, and fear of medical procedures such as needle insertion into vascular access (Stuart, 2016). As an emotional reaction to perceived threat, anxiety in patients with chronic disease is often triggered by uncertainty about disease progression, the cost of treatment, and long-term dependence on therapy. This finding is consistent with previous research showing that most hemodialysis patients experience mild-to-moderate anxiety related to the repetitive and invasive nature of the therapy (Alesandra & Cusmarih, 2024), and it corroborates earlier evidence that prolonged hemodialysis carries a measurable psychological burden for patients (Butar-Butar et al., 2022). These findings suggest that the hemodialysis procedure, together with its accompanying lifestyle restrictions and invasive routines, is a consistent trigger of anxiety in this patient population.

Pain Intensity of Cimino Puncture in Hemodialysis Patients

Most respondents experienced moderate pain intensity during Cimino puncture. Physiologically, this pain arises from the stimulation of pain receptors caused by tissue trauma during needle insertion, which is then transmitted through nerve fibers to the central nervous system and perceived as a painful sensation (Kaban et al., 2025). Pain perception is also shaped by psychological factors such as anxiety, fear, and worry, and patients with higher anxiety levels tend to experience more intense pain than calmer patients (Alesandra & Cusmarih, 2024). This finding supports the view that pain is a subjective experience shaped by an individual's emotional state rather than by the physical stimulus alone. As Cimino puncture involves a large-diameter needle inserted directly into vascular tissue, this mechanical stimulation remains a consistent physical stressor even in patients who have undergone repeated hemodialysis sessions, which helps explain why moderate pain intensity predominated in this sample.

Relationship between Anxiety Level and Pain Intensity

The Spearman Rank correlation test showed a significant positive relationship between anxiety level and pain intensity during Cimino puncture in hemodialysis patients at Adventist Hospital, Medan, indicating that higher anxiety was associated with greater pain during the procedure. This is consistent with previous studies conducted in Indonesian hemodialysis units, which similarly reported a significant relationship between anxiety and pain intensity during vascular access procedures (Maziana, 2020).

A number of respondents classified as having only moderate anxiety nevertheless reported severe pain, a pattern that can be explained through the Gate Control theory proposed by Melzack and Wall. According to this theory, pain perception is determined not only by the magnitude of the physical stimulus but also by cognitive and emotional factors; anxiety can facilitate the “opening” of the pain transmission gate in the spinal cord, so that incoming pain impulses are interpreted by the brain as more intense than the physical stimulus alone would produce (Kaban et al., 2025). Anxiety is a common psychological concern among patients with end-stage renal disease. Therefore, appropriate interventions are needed to alleviate anxiety, enhance patients’ quality of life, and potentially reduce the risk of mortality (Adi & Hamid, 2024). Anxiety also triggers the release of cortisol and catecholamines, placing the central nervous system in a state of heightened arousal that lowers the pain threshold and causes the mechanical stimulation of the Cimino needle to be perceived as more severe.

Although most respondents had undergone hemodialysis for three to four years, this duration of exposure did not eliminate anxiety related to the puncture procedure. Repeated experience with the therapy instead appears to give rise to anticipatory anxiety, in which memories of previous pain sustain a fear of recurrence even when the puncture technique is performed adequately. If left unaddressed through a holistic nursing approach, this anticipatory anxiety may keep pain perception elevated regardless of technical proficiency, underscoring psychosocial management as an essential component of patient comfort during invasive hemodialysis procedures.

Overall, these findings suggest that anxiety functions as an amplifier of physical pain: when a patient experiences heightened anxiety during Cimino puncture, the resulting psychophysiological tension lowers the pain threshold, causing the mechanical stimulation of needle insertion to be perceived more intensely by the patient’s nervous system. Managing anxiety is therefore a critical component of pain management in hemodialysis care. Nurses can

help reduce patient anxiety prior to hemodialysis through interventions such as education, relaxation techniques, distraction, and emotional support (Nurchayati, 2016).

CONCLUSION

Patients with chronic kidney failure undergoing regular hemodialysis at Adventist Hospital, Medan generally experienced mild anxiety prior to Cimino puncture, although a smaller proportion experienced moderate anxiety, indicating that the procedure continues to elicit an emotional response even among patients accustomed to routine therapy. Pain intensity during Cimino puncture was predominantly moderate, followed by mild pain, with some respondents reporting severe pain. The Spearman Rank correlation test confirmed a strong, statistically significant positive relationship between anxiety level and pain intensity ($r = 0.590$; $p = 0.000$), indicating that higher anxiety in patients is associated with greater pain experienced during the procedure. These findings support routine anxiety assessment and the integration of non-pharmacological interventions, such as education, relaxation, distraction, and emotional support, into standard nursing care for hemodialysis patients prior to Cimino puncture.

LIMITATION

This study used a cross-sectional design, which limits the ability to establish a definitive causal relationship between anxiety level and pain intensity during Cimino puncture. The relatively small sample size also limits the generalizability of the findings, and because pain was measured subjectively, some degree of response bias cannot be ruled out. Future research using larger samples, longitudinal designs, and a combination of subjective and objective pain measurements is recommended to strengthen these findings.

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