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The Effect Of Cold Compresses On Reducing The Pain Scale Of Cannulation In Chronic Kidney Failure Patients Undergoing Hemodialysis In Jakarta Cempaka Putih Islamic Hospital

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Abstract

Cannulation pain is a common problem in chronic kidney failure patients undergoing hemodialysis which impacts the patient's quality of life. Cold compress therapy is a non-pharmacological therapy to reduce pain through vasoconstriction mechanisms and modulation of nerve activity. This study aims to determine the effect of cold compresses on reducing the cannulation pain scale in chronic kidney failure patients undergoing hemodialysis at the Jakarta Islamic Hospital Cempaka Putih. Method: Using a Pre-Experiment with a One Group Pretest and Posttest Design research design with a sample of 18 respondents. There was a decrease in the pain scale with pretest pain values there were 9 respondents with mild pain and 9 other respondents with moderate pain, after being given cold compress therapy, 7 respondents did not experience pain and 11 respondents had a mild pain scale with p-value 0.001 <0.05. There is an effect of cold compresses on reducing the cannulation pain scale in chronic kidney failure patients undergoing hemodialysis at the Jakarta Islamic Hospital Cempaka Putih.

***Keywords**: Chronic Kidney Failure, Cold Compress, Cannulation Pain*

INTRODUCTION

Chronic kidney disease (CKD) is a condition that occurs due to various disease processes in the body, causing kidney function to slowly decline and ultimately leading to chronic kidney failure. Chronic kidney disease is indicated by a decreased Glomerular Filtration Rate (GFR) of less than 60 mL/minute (1.73 m²) or an increase in albuminuria levels of ≥ 30 mg/24 hours for 3 months or more [1]. Several factors that cause chronic kidney failure include hypertension, kidney stones, and diabetes mellitus. Hypertension and diabetes mellitus are the main causes of chronic kidney failure, accounting for 21% and 34% of cases, respectively [2].

According to the National Kidney Foundation [3] Globally, chronic kidney failure ranks 11th, with a death toll of over 1.42 million. In several developed countries, such as Taiwan, the incidence has increased to a total of 2,990 cases per million people. In Japan, the figure has reached 2,590 per million people, and in the United States, chronic kidney failure cases have reached 2,020 per million people. According to [4] there was an increase in the death rate in cases of chronic kidney failure in 2021, with the previous data showing 254,028 people to 843.6 million people.

According to the data [5] Chronic kidney failure cases in Indonesia reached 638,178 people or around 0.18% of the total population in 2023 with DKI Jakarta in first place with 0.22% or around 24,981 cases, followed by West Java reaching 0.20% or around 11,853 cases, Central Java with 0.19% or around 88,180 cases [6].

Treatment for kidney failure is divided into two types, namely conservative treatment and renal replacement therapy or dialysis [7]. Conservative treatment is performed to slow the progression of kidney failure, maintain patient stability, and address any reversible factors. Hemodialysis, or cannulation, involves inserting a needle into a blood vessel to provide vascular access and connecting it to a dialysis machine. This procedure can cause various side effects, such as anxiety, skin damage, hematoma, risk of infection, and pain due to the large needle insertion [8].

Pain during cannulation is caused by the trauma of the large needle puncture, the different cannulation sites, and the patient's skin condition. Pain is a common problem and significantly impacts patients. The effects include damage to skin tissue and blood vessels, affecting the patient's quality of life. Treatment can be carried out through pharmacological and non-pharmacological therapies. Pharmacological treatment involves the administration of local anesthetics such as Tropical Eutectic Mixture of Local Anesthesia (EMILA) [9]. Meanwhile, non-pharmacological treatment can be done using various actions such as distraction, deep breathing relaxation, Transcutaneous Electric Nerve Stimulation (TENS), messages, hypnosis, aromatherapy, and warm or cold compresses [10].

A cold compress is a non-pharmacological treatment that can be used to relieve pain. A cold compress causes a low temperature on the skin, which stimulates nociceptors, causing them to send signals to the central nervous system via afferent nerves. The sympathetic nervous system then sends efferent impulses, resulting in the release of norepinephrine. This causes vasoconstriction in the smooth muscles of the blood vessels, reducing blood flow to the area and causing numbness. Furthermore, a cold compress can decrease the activity of afferent nerve cells leading to the brain, thus inhibiting the conduction of pain impulses to the brain and reducing the pain response [11] [9].

The results of the preliminary study showed that the prevalence of patients with chronic kidney disease undergoing hemodialysis at Cempaka Putih Islamic Hospital, Jakarta, in September 2025 was 214 patients. When patients experience pain due to cannulation failure, the ward nurses immediately administer topical analgesics. The techniques commonly used by nurses to reduce pain include deep breathing relaxation, and pain is measured using the Wong-Baker Pain Scale.

RESEARCH METHODOLOGY

This research is quantitative with a pre-experimental research method with a "One Group Pretest and Posttest Design" research design. This research design involves a pre-test and a post-test on one group without a control group. This study was conducted to measure the level of cannulation pain in chronic kidney failure patients undergoing hemodialysis before and after cold compresses. The population in this study were chronic kidney failure patients undergoing hemodialysis at the Jakarta Islamic Hospital Cempaka Putih. This study was conducted at Jakarta Cempaka Putih Islamic Hospital from October 22 to November 12, 2025. The sampling technique used probability sampling with a simple random sampling approach using a lottery method**.** The sample size was determined using the Gay and Diehl (1992) formula, which states that the minimum sample size for experimental research is 15 participants per group. In this study, there was one group, resulting in a total of 16 respondents. To anticipate respondent dropout, the total sample size was increased by 10%, resulting in a total of 18 respondents.

KInclusion criteria include patients aged over 18 years, do not have cognitive limitations, hemodialysis access is AV shunt, undergoing hemodialysis twice a week, patients with full consciousness GCS score

15, patients with mild and moderate pain scale, willing to be participants, patients with hemodialysis duration according to schedule twice a week, Exclusion criteria include patients with HD cath and femoral installed, patients with severe pain scale, patients who are given analgesics. The instrument used to measure the level of pain is the Numeric Rating Scale (NRS).

The cold compress intervention was administered according to standard operating procedures for 3-5 minutes at a temperature of 10-15 degrees Celsius, conducted once. Data analysis included univariate analysis to describe respondent characteristics and bivariate analysis to determine differences in anxiety levels before and after the intervention. Normally distributed data were analyzed using the Paired t-test, while non-normally distributed data were analyzed using the Wilcoxon Signed Rank Test.

RESULTS AND DISCUSSION

Table 1. Frequency Distribution of Respondents Based on Age of Chronic Kidney Failure Patients Undergoing Hemodialysis at Cempaka Putih Islamic Hospital in 2025 (n=18)

Gender	Frequency	Percentage (%)
26-33	1	5.6
34-41	1	5,6
42-49	3	16,7
50-57	7	38,9
58-65	6	33,3
Total	**18**	**100.0**

Soucrce: Primary Data November 2025

Based on Table 1 above, the age of respondents is 53.28 years, with the lowest age of respondents being 28 years and the highest being 64 years.

Table 2. Distribution of Respondents Based on Gender of Chronic Kidney Failure Patients Undergoing Hemodialysis at Cempaka Putih Islamic Hospital in 2025 (n=18)

Gender	Frequency	Percentage (%)
Man	10	55.6
Woman	8	44,4
Total	**18**	**100.0**

Soucrce: Primary Data November 2025

Based on Table 2 above, the majority of chronic kidney failure patients undergoing hemodialysis are male, 10 respondents (55.6%) and female, 8 respondents (44.4%).

Table 3. Distribution of Respondents Based on Marital Status of Chronic Kidney Failure Patients Undergoing Hemodialysis at Hospital Cempaka Putih Islamic Hospital in 2025 (n=18)

Marital status	Frequency (f)	Percentage (%)
Unmarried	1	5.6
Married	17	94,4
Total	**18**	**100.0**

Soucrce: Primary Data November 2025

Based Table 3 above, the majority of marital status of chronic kidney failure patients undergoing hemodialysis is married, as many as 17 respondents (94.4%) and unmarried as many as 1 respondent (5.6%).

Table 4. Distribution of Respondents Based on Education Level of Chronic Kidney Failure Patients Undergoing Hemodialysis at Hospital Cempaka Putih Islamic Hospital in 2025 (n=18)

Marital status	Frequency	Percentage (%)
Elementary School	1	5.6
Junio High School	5	27,8

Senior High School	11	61,1
College	1	5,6
Total	**18**	**100.0**

Soucrce: Primary Data November 2025

Based on Table 4 above, the majority of patients with chronic kidney failure undergoing hemodialysis had a high school education of 11 respondents (61.1%).

Table 5. Frequency of Pain Levels before and after cold compresses were given to Chronic Kidney Failure Patients undergoing hemodialysis at Hospital Cempaka Putih Islamic Hospital in 2025 (n=18)

Cold compress	**Frequency**							**93%CI**
	No Pain	Light			Currentl y			
Scale	0	1	2	3	4	5	6	
Pretest	-	-	3	6	3	5	1	3.11-4.33
Posttest	7	5	3	3	-	-	-	0.55– 1.67

Soucrce: Primary Data November 2025

Base on Table 5 above, the pretest, there were 3 people who had a mild pain level with a scale of 2, 6 people with a scale of 3, 3 people had a moderate pain level with a scale of 4, 5 people with a scale of 5 and 1 person with a scale of 6. After the cold compress action, the pain level decreased by 7 respondents who did not experience pain, 5 people had a mild pain level with a scale of 1, 3 people with a constant scale of 2, 3 people with a scale of 3.

Table 7. Results of the Analysis of the Effect of Cold Compresses on Reducing the Pain Scale of Cannulation in Patients with Chronic Kidney Failure Hospital Cempaka Putih Islamic Hospital in 2025 (n=18)

	N	**Mean Rank**	**Sum Of Rank**	**P-Value**
Negatif Rank	15	8.00	120.00	0.0001
Positif Rank	0	0.00	0.00	
Ties	3			
Total	18			

Soucrce: Primary Data November 2025

Based on Table 7 the results of the Wilcoxon test showed that out of 18 respondents, 15 respondents experienced a significant reduction in pain levels while the other 3 were still in the mild pain category with a P-Value of 0.001 (<0.05) which indicates that there is a fairly effective influence where cold compresses can reduce the level of cannulation pain in chronic kidney failure patients undergoing hemodialysis.

DISCUSSION

1. Respondent Characteristics Overview
   a. Based on age

In this study, the average age of respondents was 53.28 years, with the lowest age being 28 years and the highest being 64 years. This is in line with research.[12]The majority of patients with HD are in the 46-65 year age group. This result is in accordance with the theory of Smeltzer & Bare (2010) in[13]said that individuals aged 40 and over are more susceptible to chronic kidney disease because at that age, the body's organs will experience degeneration, one of which is a persistent decrease in the glomerular filtration rate. Furthermore, research conducted by[14]Most chronic kidney failure patients undergoing hemodialysis are in the late elderly age category, namely 45-55 years. This is in line with[15]explained that respondents suffering from chronic kidney failure were dominated by early elderly people (46-55 years).

   b. Based on gender

The results of this study showed that the majority of respondents were male, 10 respondents (55.6%) and female, 8 respondents (44.4%). The results of this study are in line with research conducted by[16]stated that the majority of respondents

were male (59 people) and female (41 respondents). These results align with the theory proposed by Nabahan (2021), which explains that gender influences the incidence of chronic kidney failure. This condition will obstruct urine flow, ultimately leading to impaired kidney function. Furthermore, unhealthy lifestyles such as smoking and alcohol consumption increase the risk of developing chronic kidney failure at a young age and requiring hemodialysis sooner than women. However, pain reduction cannot be significantly influenced by gender; rather, it is determined more by the injection site, timing, and the patient's physiological condition. This aligns with research conducted by[17]stated that the majority of respondents with chronic kidney failure were male, with 74 respondents (61.2%), compared to female, with 47 respondents (38.8%). This result is supported by research.[18]stated that the majority of respondents with chronic kidney failure were men, 37 people (61.7%) and women, 23 people (38.3%).

c. Marital status

The results of the study showed that the majority of chronic kidney failure patients undergoing hemodialysis were married (17 respondents (94.4%), and single (1) respondent (5.6%). These results are in line with research conducted by[19]stated that the majority of respondents were married, as many as 17 people (94.4%). This result is in line with the theory put forward by[19]Studies have shown that individuals surrounded by supportive people tend to experience reduced pain levels. One effective non-pharmacological pain management method is to shift the individual's focus to other things. Interacting with close family members can distract the patient from the pain they are experiencing, thereby helping to reduce anxiety, pain, and depression. This is in line with research conducted by[20]stated that the majority of chronic kidney failure sufferers were married with a total of 189 respondents (90.0%).

d. Level of education

The results of this study indicate that the majority of patients with chronic kidney failure undergoing hemodialysis had a high school education, with 11 respondents (61.1%). These results are in line with research conducted by[21]stated that the majority of chronic kidney failure patients had a high school education (51 people, 51%). This result aligns with Smith's (2014) theory that formal education plays a role in shaping a person's perception of pain. Individuals with lower levels of education tend to experience barriers in accessing information sources, particularly regarding knowledge about pain. Furthermore, those with higher education generally have broader insights and can more easily express their perceptions of pain. This is in line with research conducted by[22]stated that the majority of chronic kidney failure sufferers had a high school education level of 86 people (82%). This result is supported by research[23]stated that the majority of chronic kidney failure sufferers had a high school education level of 43 people (61.4%).

2. Description of Pain Levels Before and After Cold Compresses Are Given to Pain Levels in Chronic Kidney Failure Patients Undergoing Hemodialysis at RSIJ Cempaka Putih

The results of the study showed that there were 3 people who had a mild pain level with a scale of 2, 6 people with a scale of 3, 3 people had a moderate pain level with a scale of 4, 5 people with a scale of 5 and 1 person with a scale of 6. After the cold compress action, the pain level decreased by 7 respondents who did not experience pain, 5 people had a mild pain level with a scale of 1, 3 people with a constant scale of 2, 3 people with a scale of 3. The research conducted[9]shows that the pain level of chronic kidney failure patients undergoing hemodialysis with an average pain level value before being given a cold compress is 5.22 and after being given it shows a fairly decreased average value, namely 2.56.

These results are in accordance with the Gate Control Theory according to Melzack & Wall 2018, where the application of cold temperatures activates large nerve fibers type A-beta and inhibits the transmission of pain impulses from small fibers type A-delta and C. Activation of these large fibers causes the closure of the pain transmission gate in the gelatinous substance in the dorsal horn of the spinal cord, so that pain impulses are not transmitted to the central nervous system. With the closure of the pain gate, the perception of pain is reduced and the pain scale decreases. This is in accordance with research[24]This study showed that the level of pain after cannulation in patients with chronic kidney failure undergoing hemodialysis varied. The average pain score before cold compresses was 7.6, while after cold compresses, the average pain score was 2.7.[25]showed that before being given a cold compress with a mean value of 51.63, after being given a cold compress showed a significant decrease in pain levels with a mean value of 9.294. Furthermore, the results of this study were also strengthened by[26]depicts the average value of the pain level before being given a cold compress, namely 5.36 and after being given a cold compress, it decreased with an average value of 3.30.

3. The Effect of Progressive Muscle Relaxation Technique on Anxiety Levels in Chronic Kidney Failure Patients Undergoing Hemodialysis at RSIJ Cempaka Putih

The research results showed that of the 18 respondents, 15 experienced a significant reduction in pain levels, while the other 3 remained in the mild pain category with a Pv of 0.001 (<0.05). These results align with previous research.[27]also showed a significant effect on pain levels before and after cold compress application, with the average pain scale decreasing from 6.33 to 3.07, with a P-Value of 0.000 ($p < 0.05$). These results are in accordance with Walter Cannon's fight or flight theory, namely the body's physiological reaction to threats. Cold compresses are a technique of applying low temperatures locally that can trigger various physiological reactions. The use of cold compresses triggers constriction of blood vessels, thus causing a sensation of numbness or tingling on the surface of the skin. This cold temperature also slows cell metabolism and inhibits sodium channels in free nerve endings, so that the flow of pain signals to the brain is hampered.[28]. This result is supported by research[29]which shows that applying a cold compress has an effect on reducing the pain scale, with the average pain score before applying the cold compress being 4.3, while after applying the cold compress, the average pain score decreased to 3.92. The p-value obtained was 0.003 (<0.005). These results are supported by research[30]shows that there is an effect of cold compresses on reducing the pain scale with a mean value at pre-point of 6.16 and post-point of cold compresses experiencing a greater reduction in pain of 4.34. With a p-value of $0.000 < 0.05$.

CONCLUSION

From the results of the research that has been carried out, it can be concluded that:

1. The description of the characteristics of the respondents in this study shows that the average age of respondents was 53.28 years with the lowest age being 28 years and the highest being 64 years. Based on gender, the number of male respondents was 10 people (55.6%). Based on marital status, the majority of respondents were married, as many as 17 respondents (94.4%). Furthermore, based on education level, the majority of patients' last education was high school, as many as 11 respondents (61.1%).
2. The results of the pain scale before the cold compress procedure consisted of 3 people having a mild pain level with a scale of 2, 6 people with a scale of 3, 3 people having

a moderate pain level with a scale of 4, 5 people with a scale of 5 and 1 person with a scale of 6, after the cold compress procedure the patient experienced a decrease in pain levels of 7 respondents did not experience pain, 5 people had a mild pain level with a scale of 1, 3 people with a constant scale of 2, 3 people with a scale of 3.

3. There is an effect of giving cold compresses on reducing the pain scale of cannulation in chronic kidney failure patients undergoing hemodialysis at Cempaka Putih Islamic Hospital with p-value 0.001 < 0.05

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