Jurnal Kegawatdaruratan Medis Indonesia (JKMI)
Volume 4 Issue 2, August 2025, pp 188-198
https://ebsina.or.id/journals/index.php/jkmi
EISSN 2502-2717

The Application of Cold Compression to Reduce Pain Scale in Postoperative Fracture Patients at Kartini Regional General Hospital of Karanganyar

Amelia Ayu Kusuma Wardhani[1]*, Ida Nur Imamah[1], Sugito[2]
[1] 'Aisyiyah University of Surakarta, Indonesia
[2] Kartini Regional Hospital, Karanganyar, Indonesia

ARTICLE INFO

Article History:
Submitted: 17-06-2025
Revised: 12-07-2025
Accepted: 23-07-2025
Published: 26-08-2025

doi.org/10.58545/jkmi.v4i2.519

ABSTRACT

Background: Fractures are a primary global health concern, with an estimated incidence of 440 million cases worldwide. The most commonly affected areas are the lower extremities (67%) and upper extremities (32%). Preliminary data from Kartini Karanganyar Regional General Hospital (RSUD) revealed a rising trend in fracture cases over the past three years: 309 patients in 2022, 428 in 2023, and 435 in 2024. **Objective:** This study aimed to evaluate the effectiveness of cold compression therapy in reducing pain levels among postoperative fracture patients at Kartini Karanganyar Hospital. **Method:** A case study design was employed for 2 respondent, with pain intensity measured before and after intervention using the Visual Analog Scale (VAS). Cold compresses were applied for 20 minutes over 2 days. **Results:** Both respondents showed reduced pain scale scores following the cold compress intervention. **Conclusion:** Applying cold compresses effectively reduces postoperative pain in fracture patients, supporting its use as a non-pharmacological pain management strategy.
Keywords: Pain Scale, Postoperative Fracture, Cold Compress

Corresponding Author:
Amelia Ayu Kusuma Wardhani
'Aisyiyah University of Surakarta, Indonesia
Jl. Ki Hajar Dewantara No.10, Kota Surakarta, Jawa Tengah 57146, Indonesia
Email: ameliakusuma251@gmail.com

How to cite:
Wardhani, A. A. K., Imamah, I. N., & Sugito. (2025). The Application of Cold Compression to Reduce Pain Scale in Postoperative Fracture Patients at Kartini Regional General Hospital of Karanganyar. Jurnal Kegawatdaruratan Medis Indonesia, 4(2), 188-198. https://doi.org/10.58545/jkmi.v4i2.519

1. INTRODUCTION

According to the World Health Organization (WHO) in 2022, fractures have increased compared to 2020, with approximately 440 million cases recorded globally. In Indonesia, fractures are highly prevalent, primarily caused by traffic accidents. In 2019, Indonesia reported 116,411 traffic accidents, resulting in 25,671 fatalities, 12,475 severe injuries, and 137,342 minor injuries (RISKESDAS, 2018). The 2018 RISKESDAS data also revealed that the most frequently fractured body parts were the lower extremities (67%), upper extremities (32%), head injuries (11.9%), back injuries (6.5%), chest injuries (2.2%),

and abdominal injuries (2.6%). The prevalence of fractures in Central Java was 16.7% (RISKESDAS, 2018). Traffic accidents do not solely cause fractures but may also result from sports injuries, falls, or natural disasters.

A preliminary study at Kartini Karanganyar Regional General Hospital (RSUD) showed a significant rise in fracture cases over the past three years: 309 patients in 2022, 428 in 2023, and 435 in 2024.

A fracture is defined as a discontinuity in bone structure, classified by type and severity. It is a partial or complete disruption of bone continuity caused by pathological conditions or trauma (Oleh, 2024). Fracture patients often experience pain due to displaced or damaged bone fragments. This pain arises from nerve damage, blood vessel injury, or movement of bone fragments (Sulistyawati & Agustin, 2024).

Fracture-related pain can lead to muscle tone changes and autonomic reactions such as diaphoresis, blood pressure fluctuations, altered pulse rate, pupil dilation, and respiratory rate variations. In severe cases, it may even trigger shock. Pain management in fracture patients is essential to alleviate suffering and improve quality of life. Nearly all fracture sites can cause pain, necessitating effective therapeutic interventions to reduce discomfort. Untreated pain may delay recovery and increase mortality rates (Oleh, 2024).

Unmanaged postoperative pain can disrupt physiological responses, manifesting as verbal expressions, facial grimacing, or vocal reactions (Az et al., 2022). One non-pharmacological technique for reducing pain in fracture patients is cold compression therapy. Cold compresses alleviate pain and edema by constricting blood vessels, reducing blood flow, and decreasing inflammation. The analgesic effect of cold therapy is attributed to slowed nerve conduction, which diminishes pain signals transmitted to the brain (Donny et al., 2023). Additionally, cold therapy inhibits prostaglandin production, reducing pain receptor sensitivity and inflammatory responses (Oleh, 2024).

A previous study by Admin et al. (2021) demonstrated that cold compression significantly reduces pain in postoperative fracture patients. The cooling sensation improves blood circulation, minimizes postoperative edema, and alleviates discomfort. Statistical analysis (paired t-test) confirmed a significant reduction in pain scores ($p = 0.000$, $\alpha = 0.05$). Similarly, Ucik et al. (2023) found that cold compresses

Volume 4 Issue 2, August 2025, pp 188-198
https://ebsina.or.id/journals/index.php/jkmi
EISSN 2502-2717

decrease localized pain by reducing blood flow, edema, and nerve impulse transmission.

At Cempaka 2 Ward, Kartini Karanganyar Hospital, 30 fracture cases were recorded from October to December 2024, with an additional 6 cases in early January 2025. Interviews with the ward's head nurse revealed that cold compression therapy had never been implemented for postoperative pain management. Current complementary therapies include deep breathing exercises and limb elevation. However, as noted by Sri & Poppy (2025), analgesic effects last only 4–6 hours, highlighting the need for non-pharmacological alternatives like cold therapy.

Given this background, the researcher aims to investigate the "Application of Cold Compression to Reduce Pain Scale in Postoperative Fracture Patients at Kartini Regional General Hospital of Karanganyar."

2. METHODS

The research used a descriptive case study design to describe nursing care involving cold compress therapy in reducing pain scale among postoperative fracture patients at Kartini Regional General Hospital of Karanganyar. This was done by measuring the pain scale before and after surgery and administering cold compress treatment. The case study involved two patients diagnosed with fractures at Kartini Regional General Hospital of Karanganyar who met the inclusion and exclusion criteria. Inclusion criteria included: patients undergoing postoperative fracture care, patients on the first day post-surgery, patients willing to participate as respondents, and those who could communicate and cooperate effectively. Exclusion criteria were: patients who withdrew from participation, patients with impaired consciousness, and patients with cold allergies.

The patients selected for the study were those receiving treatment in the Cempaka 2 ward of Kartini Regional General Hospital of Karanganyar due to bone fractures. Based on observation and interviews with nurses, two patients were identified. The cold compress procedure began with positioning the patient, then applying the compress around the fracture area for 20 minutes. The cold compress therapy was administered over two days.

Data collection started with an assessment covering patient identity details such as name, age, gender, religion, education level, address, admission date, assessment date, medical record number, and medical diagnosis. The main complaints reported were pain and limited

mobility due to fractures. Medical history review showed no prior illnesses or family history of disease. General physical examination revealed stable vital signs and varying muscle weakness in the affected limbs. The primary nursing diagnosis for both patients was acute pain related to physical injury (D.0077). Pain assessment was performed using the Visual Analog Scale (VAS), while interventions included non-pharmacological methods such as cold compresses, rest facilitation, and environmental control. Additional educational strategies were also implemented to help patients manage their pain independently and collaborate with medical staff for analgesic administration if necessary.

Radiological assessments confirmed the presence of fractures: one patient had a complete distal third tibia and fibula fracture on the right leg, and the other had a fracture on the fifth digit of the left foot. Laboratory findings showed normal hemoglobin and hematocrit levels, although some inflammatory markers were elevated. Pharmacological therapy included intravenous Ringer's Lactate, Ketorolac for pain management, and antibiotics such as Ceftriaxone and Cefazolin.

Pain, as defined in this study, refers to an unpleasant or painful sensation caused by actual or potential tissue damage, measured using the VAS with scores ranging from 0 (no pain) to 10 (unbearable pain). A cold compress is a method of injury management using low temperature to reduce pain and swelling. Data collection was conducted in three stages: preparation, implementation, and termination. During the preparation phase, the researcher gathered literature, determined the research title and location, obtained approval from academic and field supervisors, and secured preliminary data from the hospital. During the implementation phase, informed consent was obtained from eligible patients, nursing care plans were developed, pain levels were measured before and after the intervention, and cold compresses were applied for 20 minutes, three times daily, before analgesic administration. The intervention was carried out over two consecutive days. During the termination phase, collected data were processed and analyzed using computer software, and a final report was prepared and presented.

Data analysis consisted of data reduction, data presentation, and conclusion. Observational and interview data were transcribed and categorized according to research objectives. Pain measurements before and after the cold compress application were compared to

assess changes in pain perception between the two respondents. Ethical considerations were strictly observed throughout the research process. Researchers obtained formal recommendations from the Nursing Science Study Program at Universitas 'Aisyiyah Surakarta and ensured informed consent, anonymity, confidentiality, veracity, and justice. Patient identities were protected by using coded numbers instead of real names, and all collected data were kept confidential and destroyed after two years. The benefits and potential effects of the research were clearly explained to participants, ensuring fairness and transparency throughout the study.

3. RESULTS

Kartini Regional General Hospital of Karanganyar is a public hospital owned by the Karanganyar Regency government. The hospital originated from "Kartini" Maternity Home, established on April 21, 1960, by community figures led by Mr. Narjo Adirejo, the Deputy Regent of Karanganyar. Kartini Regional General Hospital of Karanganyar meets the criteria for a Class C General Hospital based on organizational analysis, facilities, and capabilities, as confirmed by the Decree of the Minister of Health of the Republic of Indonesia Number 009-1/MENKES/1/1993 regarding the organizational structure and work procedures of Karanganyar General Hospital.

In 2025, Kartini Regional General Hospital of Karanganyar will become an important referral center for the people of Karanganyar and the surrounding areas, with increasingly modern and comprehensive services, including the possibility of new facilities and specializations added to meet the evolving healthcare needs of the community. The hospital has 149 inpatient beds distributed across VIP, Class I, Class II, Class III, treatment, and isolation rooms.

This research was conducted in the Cempaka 2 ward because it is a specialized surgical ward. Cempaka 2 ward itself has 40 beds and is supported by 20 nurses. Within the ward are one room for medical equipment and one for medications.

This study aimed to determine the application of cold compress therapy in reducing pain scale among postoperative fracture patients in Cempaka 2 ward. Two respondents were selected for this study.

Table 1. Pain Measurement Before Cold Compress Application

Respondent	Pain Scale	Description
Ms.N	6	Severe pain
Mrs.I	5	Moderate pain

Based on Table 1, before receiving cold compress therapy, Ms.N's pain scale was 6 (severe pain), while Mrs.I's pain scale was 5 (moderate pain).

Table 2. Pain Measurement Before Cold Compress Application

Respondent	Pain Scale	Description
Ms.N	4	Moderate pain
Mrs.I	3	Mild pain

Based on Table 2, after receiving cold compress therapy, Ms.N's pain scale decreased to 4 (moderate pain), while Mrs.I's pain scale dropped to 3 (mild pain).

Table 3. Development of Pain Scale

Day	Name	Age	Pre-test	Post-test	Decrease
1st	Nn.N	20 yrs	6	5	1
2nd			6	4	2
1st	Ny.I	25 yrs	5	4	1
2nd			5	3	2

Based on Table 3, on the first day, Ms.N experienced a decrease of 1 point, and on the second day, a decrease of 2 points. Meanwhile, for Ms.I, the decrease on the first day was 1 point, and on the second day, it was 2 points.

Table 4. Comparison of Final Results

Respondent	Before Cold Compress	Description	After Cold Compress	Description	Difference
Ms.N	6	Severe pain	4	Moderate pain	2
Mrs.I	5	Moderate pain	3	Mild pain	2

Based on Table 4, there was a decrease in the pain scale scores. For Ms.N, the pain level before cold compress application was 6 (severe pain) and decreased to 4 (moderate pain). For Mrs.I, the initial pain score was 5 (moderate pain), which decreased to 3 (mild pain). Both respondents showed a difference of 2 points in their pain scales.

4. DISCUSSION

Pain Scale Before Cold Compress Therapy

The case study results showed that the subjects receiving cold compress therapy were aged 20 and 25 years, respectively. The pain scale before administering the cold compress therapy for respondent 1 was 6, indicating severe pain, while respondent 2 had a pain score of 5, representing moderate pain. Both respondents experienced postoperative pain at the surgical site. As age increases,

Volume 4 Issue 2, August 2025, pp 188-198
https://ebsina.or.id/journals/index.php/jkmi
EISSN 2502-2717

postoperative fracture patients tend to have more profound experiences with pain compared to younger individuals, resulting in psychological adaptation and increased tolerance toward pain (Admin et al., 2021). Before applying the cold compress, assessments were conducted at 7:00 AM before analgesic administration to measure the intensity of pain experienced by both respondents.

Each individual perceives pain differently. According to Malorung & Anggrita (2022), postoperative pain is common following surgery. This pain arises from tissue damage caused by surgical procedures that open the skin, stimulating pain impulses through sensory nerves and triggering pain perception in the brain via afferent nerves, which activate chemical mediators of pain.

Pain Scale After Cold Compress Therapy

The results showed decreased pain levels after two days of cold compress application lasting 20 minutes per session. Respondent 1, who initially had severe pain (score of 6), experienced a reduction to moderate pain (score of 4) after therapy. Similarly, respondent 2, who started with moderate pain (score of 5), reported mild pain (score of 3) after receiving the cold compress.

These findings align with research conducted by Ariana & Wulaningrum (2023), which demonstrated the effectiveness of cold compresses in reducing postoperative fracture pain. It also supports the findings of Admin et al. (2021), showing a significant impact of cold compress application on pain levels in postoperative patients.

Cold compress therapy is a method that uses localized low temperature to produce physiological effects. The therapy works by stimulating the skin surface to control pain. The cooling sensation applied around the painful area, on the opposite side of the body related to the pain location, or between the brain and the pain site, tends to be more effective when applied near the affected area (Ariana & Wulaningrum, 2023).

Development of Pain Scale Before and After Cold Compress Therapy

Both respondents, Ms.N and Mrs.I, experienced a decrease in their pain scores between pre- and post-intervention assessments over two consecutive days. On day one, Nn.N's pain level decreased from 6 to 5 (a difference of 1), while Mrs.I's dropped from 5 to 4 (also a difference of 1). On day two, Ms.N's pain decreased from 6 to 4 (a difference of 2), and Mrs.I's went from 5 to 3 (also a difference of 2).

Assessments were performed at 7:00 AM before medication to measure baseline pain intensity. Since analgesics typically last only 4–6 hours (Sri & Poppy, 2025), the cold compress was applied prior to drug administration.

This improvement can be attributed to several factors, particularly the patients' conditions following bone fractures. The decrease in pain occurred after the researcher implemented the cold compress therapy. Both respondents showed similar reductions in pain scores 1 point on day one and 2 points on day two. The respondents' ages may influence this similarity. Research by Admin et al. (2021) highlights that individuals under 30 years old tend to experience pain more deeply as they age, gaining psychological insight and adaptive capacity toward pain.

In addition to age, gender also influences pain perception, as Tuna & Yunus (2023) explained. Women are generally more aware of health issues and more likely to seek help, whereas men often suppress pain. Overall, there is no significant difference in how men and women respond to pain; however, certain cultural norms suggest that boys should appear braver and avoid crying compared to girls in similar pain situations.

Hidayati et al. (2022) noted that biological and psychological factors contribute to differences in pain perception between genders. Female hormones such as estrogen and progesterone play a role in pain sensitivity. Estrogen has a pronociceptive effect, promoting peripheral and central sensitization, while progesterone lowers the pain threshold. These hormonal influences explain why women tend to perceive pain more intensely than men.

Comparison of Final Results Between Two Respondents

Both respondents showed reduced pain levels after receiving cold compress therapy for two consecutive days. On day one, respondent 1 had a pain score of 6, and respondent 2 scored 5, indicating severe and moderate pain, respectively. By day two, respondent 1's pain score dropped to 4, and respondent 2's fell to 3, indicating moderate and mild pain.

The final results demonstrate that cold compress therapy helps reduce pain but requires gradual implementation. This finding is supported by Kurniawati (2024), who found that pain reduction in postoperative patients resulted from applying cold compresses around the surgical area, creating a numbing effect on the skin layer and lowering pain intensity.

Cold compress therapy involves applying cold to a specific body area using

Volume 4 Issue 2, August 2025, pp 188-198
https://ebsina.or.id/journals/index.php/jkmi
EISSN 2502-2717

a cloth-filled ice pack or cold water, producing a cooling effect. Its purpose is to relieve pain caused by edema or trauma by constricting blood vessels and reducing blood flow. The therapy is believed to generate an analgesic effect by slowing nerve impulse transmission, thus reducing the number of pain signals reaching the brain (Tuna & Yunus, 2023).

Study Limitations

This case study inevitably faced several limitations and challenges. One major constraint was the researcher's inability to monitor and control the patients' pain levels fully. Additionally, the limited time available for implementation restricted the ability to optimally apply the cold compress therapy.

5. CONCLUSION

The pain scale scores before the application of cold compress therapy showed that respondent Ms.N experienced severe pain with a score of 6, while Mrs.I reported moderate pain with a score of 5. After receiving cold compress therapy, both respondents demonstrated reduced pain levels. Ms.N's pain score decreased from 6 to 4, indicating a shift from severe to moderate pain, and Ms.I's pain level dropped from 5 to 3, moving from moderate to mild pain. The development of pain scores before and after the intervention revealed a consistent decrease in both respondents, showing similar improvement patterns. On the first day, there was a reduction of 1 point in pain intensity for both individuals, and on the second day, the decrease reached 2 points. When comparing the outcomes between the two respondents, it became evident that cold compress therapy played a significant role in alleviating postoperative pain caused by fractures. These findings indicate that cold compress therapy reduces pain intensity among postoperative fracture patients.

For the general public, the results of this study can be further developed and applied within communities due to the simplicity and effectiveness of the method. Cold compress therapy offers an accessible and practical approach to managing pain, especially for individuals recovering from injuries or surgeries. For nursing educators and professionals in nursing science and technology, this study provides evidence-based insights aligned with standard operating procedures. It supports the integration of non-pharmacological interventions like cold compress therapy into clinical practice for managing postoperative pain in fracture patients. This approach complements pharmacological treatments and enhances

patient comfort and recovery through holistic care strategies.

ACKNOWLEDGEMENT

We would like to thank the chairman of Kartini Regional General Hospital of Karanganyar and the participating respondents for their cooperation in this study.

AUTHOR CONTRIBUTIONS

The author contributes in conceptualization, data collection and analysis: Amelia Ayu Kusuma Wardhani, Ida Nur Imamah, Sugito. Writing and manuscript revisions: Nadia Agus Tina.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available upon reasonable request from the corresponding author.

REFERENCES

Aditama, P. W., Saraswati, N. W. S., & Pramana, I. G. K. C. A. C. (2024). Pelatihan Penggunaan Teknologi Augmented Reality Pengenalan Tulang untuk Meningkatkan Pembelajaran Interaktif pada Sekolah Dasar. KOMET: Kolaborasi Masyarakat Berbasis Teknologi, 1(2), 61–66. https://doi.org/10.70103/komet.v1i2.17

Admin, Ovi Anggraini, & R.A. Fadila. (2021). Pengaruh Pemberian Kompres Dingin Terhadap Penurunan Skala Nyeri Pada Pasien Post Operasi Fraktur Di Rs Siloam Sriwijaya Palembang Tahun 2020. Jurnal Kesehatan Dan Pembangunan, 11(21), 72–80. https://doi.org/10.52047/jkp.v11i21.101

Ariana, I., & Wulaningrum, D. N. (2023). Pengaruh Terapi Kompres Dingin Terhadap Penurunan Nyeri Pada Pasien Post Operasi Hari Ke-2 Fraktur Femur Dextra Di Rsud Dr. Gondo Suwarno Ungaran. skala 2.

Az, R., Tarwiyah, T., & Maulani, M. (2022). Pengaruh Teknik Relaksasi Genggam Terhadap Skala Nyeri Pasien Post Operasi. JINTAN: Jurnal Ilmu Keperawatan, 2(1), 27–32.

https://doi.org/10.51771/jintan.v2i1.216

Donny, N., Mataputun, R., Kep, M., Program, D., Keperawatan, S., & Waras, S. S. (2023). Pengaruh Kompres Air Dingin Terhadap Nyeri Luka Post Op Fraktur. 5, 53–63.

Jan S. Purba. (2022). Peran Analgesik Nonsteroidal Anti-inflammatory Drugs (NSAID) dan Analgesik Non-NSAID dalam Penanganan Nyeri. Medicinus, 35(1), 51–54. https://doi.org/10.56951/medicinus.v35i1.90

Kurniawati, D. (2024). Efektifitas Kompres Dingin Terhadap Nyeri Insersi Fistula Pada Pasien Hemodialisa Di Unit Dialisis. Jurnal Kesehatan dan Teknologi Medis (JKTM). 06(02), 64–73.

Malorung, & Anggrita. (2022). Penerapan Kompres Dingin Unyuk Mengurangi Intensitas Nyeri Pada Pasien Post Operasi Di Rsud Jend. Ahmad Yani Metro. Cendikia Muda, 2, 162–167.

Oleh, D. (2024). Naskah Publikasi Asuhan Keperawatan Pada Pasien Close Fraktur : Nyeri Akut Dengan Intervensi Kombinasi Terapi Nim . P21026 Program Studi Keperawatan Program Diploma Tiga Fakultas Ilmu Kesehatan Universitas Kusuma Husada Surakarta Tahun 2024.

Sri, I. N., & Poppy, I. (2025). Edukasi Obat Analgesik kepada Ibu-ibu Dasa Wisma RW 06 Kelurahan Ciracas Jakarta Timur. 35–45.

Ucik, I., Ricky Akbaril, O. F., & Rosyidah, I. (2023). Pengaruh Kompres Dingin Terhadap Intensitas Nyeri Pada Pasien Post Operasi Fraktur. Jurnal Insan Cendekia, 10(3), 243–251.