

The Effect of Cold Compression on the Reduction of Pain Intensity in Patients with Closed Fractures at Kota Langsa Hospital, Indonesia

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Abstract. Fractures or broken bones are one of the musculoskeletal conditions that often result in pain for patients. The pain experienced can affect the healing process and increase morbidity and mortality rates. Cold compression is one of the non-pharmacological therapies that can be given to reduce pain in fracture patients. This study aims to determine the effect of mean reduction on reducing pain intensity in closed fracture patients at Langsa City Hospital. The method used in this study is quasi-experimental with a one-group pretest-post-test design. The research sample consisted of 30 closed fracture patients using accidental sampling techniques. The results showed a significant effect of cold compression on reducing pain intensity in closed fracture patients, with a p-value of 0.000, smaller than $\alpha=0.05$. It is hoped that the results of this study can benefit closed fracture patients in hospitals to use non-pharmacological therapy in reducing pain so that patients are not solely dependent on medication.

Keywords: fractures; cold compresses; pain; pain intensity.

INTRODUCTION

A fracture or bone break is a condition that damages the bone structure which causes the bone to break or crack. Fractures can be caused by various factors such as trauma and other risk factors such as age, gender, family history of osteoporosis, and the use of oral or systemic glucocorticoids. Fractures can be caused by traumatic events such as traffic accidents and non-traffic accidents. The incidence of bone fractures or fracture incidents in Indonesia is relatively high. Based on data from the Ministry of Health of the Republic of Indonesia, in 2018, around eight million people experienced different types of fractures. A survey by the Ministry of Health found that 25% of fracture patients died, 45% experienced physical disabilities, 15% experienced psychological stress such as anxiety and depression, and 10% experienced an excellent recovery [1]. Other factors that can affect the risk of fractures include the use of oral or systemic glucocorticoids, age, gender, previous bone fractures, and family history of osteoporosis [2]. One of the clinical manifestations experienced by fracture patients is pain. Pain in fracture patients is sharp and piercing and can be caused by bone infec-

tions due to muscle spasms or compression of sensory nerves.

One way to reduce pain in fracture patients non-pharmacologically is by applying a cold compress to the painful area. Cold therapy is easily accessible and affordable for treating musculoskeletal injuries [4]. Cold compress therapy is a conventional method widely used to reduce pain in patients with chronic conditions such as knee swelling and after surgery. However, from preliminary studies conducted at Langsa General Hospital, nurses tend to give pain medication to closed fracture patients rather than suggesting non-pharmacological pain management, such as cold compress therapy. Cold compress therapy is widely used to reduce pain, trismus, and operation [5]. The results of studies on the efficacy of cold therapy on clinical outcomes in patients with chronic conditions such as knee swelling are inconsistent [6]. Cold water causes a significant decrease in conductivity and arterial blood flow and reduces muscle pain levels [7]. Postoperative pain management is essential to adequate rehabilitation, recovery, and patient satisfaction [8]. The use of cold compress is believed to increase the release of endorphins that block pain stimulus transmission and stimulate large-diameter A-

beta nerve fibres, thereby reducing pain impulse transmission through small A-delta and C nerve fibres. Nurses must safely manage pain with cold compress therapy [9]. The cold compress provides pain-relieving and physiological effects such as reducing tissue inflammation response, decreasing blood flow, and reducing edema [10]. In a preliminary study conducted by researchers in March at the RTA ward of the Langsa General Hospital, through interviews with ten patients who suffered from closed fractures, it was found that when experiencing pain, patients immediately called the nurse to request pain medication and the nurses did not suggest non-pharmacological pain management. Based on this background, the researchers were interested in studying the effect of cold compress on reducing pain intensity in patients with closed fractures at the Langsa City Hospital.

MATERIAL AND METHODS

This quasi-experimental study uses a one-group pretest-post-test design without a comparison (control) group [11]. The study measured the pain scale before and after cold compress application on patients with closed fractures. The sampling technique used was non-probability (purposive sampling) with a sample size of 30 respondents. The research was conducted at the Langsa City General Hospital. The research instrument used to collect data was a numeric scale to assess pain intensity before and after cold compress intervention on patients with closed fractures, written on observation sheets. The cold compress procedure used an ice pack for 5 minutes, using half of the crystal ice in the ice pack. The data analysis in this study used bivariate analysis, aiming to determine the effect of cold compress on pain reduction in patients with closed fractures before and after the intervention, using the dependent t-test formula with a confidence level of 95% or by comparing the p-value with the α value of 0.05.

RESULTS AND DISCUSSION

Univariate Analysis. The following is statistical data regarding the population based on various classifications such as age and gender. Based on Table 1, the researcher categorized the respondents' age according to the WHO age categories, namely children (2-10 years old), adolescents

(11-19 years old), adults (20-60 years old), and elderly (> 60 years old).

Table 1 – Distribution Description of Research Subjects Based on Age and Gender

No	Respondent demographics	N	%
1	Age		
	2–10 years (Children)	4	13.3
	11–19 years (Teenagers)	7	23.3
	20–60 years (Adult)	17	56.7
	> 60 years old (Elderly)	2	6.7
2	Gender		
	Man	20	66.7
	Woman	10	33.3

The selection of children as respondents was adjusted to the sample inclusion criteria, where they were willing and able to communicate well. The children's samples in this study were at least seven years old. The distribution of respondents by age showed that most subjects were adults (56.7%), and only 6.7% were elderly respondents. Furthermore, the distribution of respondents by gender showed that the majority were male (66.7%).

Fracture Location. Based on Table 2, most respondents experienced fractures in the upper extremities or radius (60%), and only 6.7% experienced femur fractures. Pre-Cold Compression Intervention

Table 2 – Description of the fracture location experienced by the respondents

No	Respondent demographics	N	%
1	Radius	18	60.0
2	Femur	2	6.7
3	Humerus	3	10.0
4	Tibia	7	23.3

Based on Table 3, before the implementation of cold compression intervention on fracture patients, most respondents experienced moderate pain (56.7%), and only 6.7% experienced mild pain.

Post-Cold Compression Intervention. Based on Table 4, after the cold compression intervention was performed on fracture patients, most respondents experienced mild pain (70%), and 6.7% no longer felt pain.

Table 3 – Frequency Distribution of Pre-Cold Compression Intervention

No	Value Range	Category	N	%
1	0	No Pain	0	0
2	1–3	Mild Pain	2	6.7
3	4–6	Moderate Pain	17	56.7
4	7–10	Severe Pain	11	36.7
	Total		30	100

Table 4 – Frequency Distribution of Post-Cold Compression Intervention

No	Value Range	Category	N	%
1	0	No Pain	0	0
2	1–3	Mild Pain	2	6.7
3	4–6	Moderate Pain	17	56.7
4	7–10	Severe Pain	11	36.7
	Total		30	100

Bivariate Analysis. Based on Table 5, the average pain scale of respondents before the cold compression intervention was 6.00 (moderate pain), and the average pain scale after the cold compression intervention was 2.67 (mild pain).

Table 5 – Mean Values Before and After Intervention

Parameters	Mean	N	Std. Deviation	Std. Error Mean
Pre-Intervention Pain Scale	6.00	30	1.365	.249
Post-Intervention Pain Scale	2.67	30	1.348	.246

There is a difference between the two data, and the significance level can be seen in Table 6.

Table 6 – Paired T-Test Results

Parameters	Paired Differences					T	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre-Intervention Pain Scale, Post-Intervention Pain Scale	3.333	.959	.175	2.975	3.691	19.039	29	.000

Table 6 shows that there is an effect of cold compression on reducing the pain intensity of fracture patients. Based on the research results, there is an effect of mean reduction on reducing the pain intensity of fracture patients. The paired t-test results show the significance level of the cold compression intervention in reducing the pain intensity with a value of 0.000, which is smaller than the value of $\alpha = 0.05$. The calculated t-value of 19.039 is greater than the t-table value of 2.045

Cold compression has an impact on reducing pain intensity in patients with closed fractures at Langsa City Hospital. This is evidenced by the paired t-test results, which showed a significant level of cold compression intervention in reducing pain intensity with a value of 0.000, smaller than $\alpha = 0.05$. This research is also consistent with several other studies, which found significant differences in pain intensity scores between the two groups on the first, second, and third

days after surgery ($p = 0.05$), indicating that cold compression has an analgesic function that can reduce pain [12]. These results are in line with the research hypothesis, which is that there is an effect of cold compression on reducing pain intensity in fracture patients at Langsa City General Hospital. According to [13], there is a significant difference in pain intensity in closed fracture patients after cold compression in the experimental and control groups. This is also consistent with previous research [14], which states that fracture patients who were given cold compression experienced a significant decrease in pain. According to [9], there was a substantial difference in the average pain intensity before and after cold compression intervention, with a p-value of 0.005 in postoperative ORIF patients (9).

The same thing in research [15] states that cold compression reduces pain intensity in fracture patients at Ungaran Regional Hospital. This proves that cold reduction effectively reduces pain in patients with fractures. The researcher

assumes that pain in patients with closed fractures can be overcome with pharmacological therapy. Still, in addition to pharmacological therapy, non-pharmacological treatment can also be performed, one of which is the administration of cold compression so that patients do not rely on drugs. It is safe and easy, with few or no side effects. This is based on the research conducted by the researcher, where all respondents stated that they felt good after receiving cold compress, with the majority of respondents experiencing mild pain (70%) and 6.7% of respondents no longer feeling any pain. The research results have shown that applying cold compress on fracture patients has a positive effect in reducing the intensity of pain experienced by the patients, making them feel more comfortable. Compression is routinely applied immediately after acute injury or surgery to reduce pain, swelling and accelerate functional recovery [16]. Cold water causes a significant decrease in conduction and arterial blood flow, relieving muscle pain levels [7]. Post-operative pain management is essential for effective rehabilitation, recovery, and patient satisfaction. Therefore, cold compression can be consid-

ered a productive non-pharmacological therapy alternative for managing pain in closed fracture patients. Based on the research findings, the author recommends regularly applying cold compression to closed fracture patients after acute injury and surgery. In addition, education and socialization of medical personnel about the benefits and correct techniques of cold reduction are needed. Thus, it is expected to improve the quality of pain management in fracture patients and accelerate their functional recovery process.

CONCLUSIONS

Applying cold compress for 5 minutes can reduce pain intensity in patients with closed fractures. Cold compresses on closed fractures can be an alternative option to reduce pain intensity non-pharmacologically, relatively free from side effects for patients.

Conflict of interest

The authors declare no conflict of interest.

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