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PAIN MANAGEMENT IN THE CLINICAL PRACTICE WITH NON-PHARMACOLOGICAL THERAPY WARM COMPRESS: SYSTEMATIC REVIEW

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ABSTRACT
Pain is a distressing sensory and emotional experience caused by tissue damage. Pain management can be pharmacological or non-pharmacological, with warm compress therapy as a supportive treatment to reduce pain scores. This study aims to analyse the effectiveness of warm compress therapy in pain management. This Systematic Review includes articles from Science Direct, PubMed, Cochrane Library, and Google Scholar (2014-2024). Article assessment was conducted using the Joanna Briggs Institute instrument, with inclusion criteria based on PICOS: pain patients (P), warm compress intervention (I), control group (C), pain score reduction (O), and RCT studies (S). Based on 10 reviewed articles, warm compress therapy is applied through various methods, including hot compresses, electric heating pads, warm water bags, Chinese herbs, infrared belts, and sterile towels. Besides pain reduction, this therapy improves blood circulation, relaxes muscles, and reduces anxiety. Warm compress therapy is recommended as a non-pharmacological approach to pain management.

Keywords: non-pharmacological therapy; NRS; pain; VAS; warm compress therapy

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INTRODUCTION

Pain is a distressing sensory and emotional experience caused by actual or potential damage to tissues or described in terms of such damage. It affects around 20 per cent of the world's population and causes a significant economic and health burden. (Cao et al., 2024). Pain is the main reason patients come to health facilities, with 70% coming through the Emergency Department (IGD) (Admassie et al., 2022). Nursing interventions for managing patient pain in hospitals remain suboptimal, as nurses primarily rely on pharmacological treatments like analgesics instead of non-pharmacological approaches. According to Kolcaba's theory, patient comfort encompasses physical, psychospiritual, environmental, and social aspects. Nurses are crucial in enhancing patient comfort through nursing care, including non-pharmacological pain management (Kolcaba, 2001).

Combining pharmacological and non-pharmacological methods provides better pain relief. Standard non-pharmacological techniques include deep breathing, guided imagery, distraction, and warm compresses, the latter being a method that soothes specific body areas by applying warmth (Sakamoto et al., 2018). The pain mechanism involves several interconnected processes, including nociception, peripheral sensitisation, phenotypic changes, central sensitisation, ectopic excitability, structural reorganization, and reduced inhibition. Pain perception is a complex physiological process that engages the central nervous system (CNS) and the peripheral nervous system (PNS). Numerous neural structures, cells, and molecules work together to facilitate the transduction, transmission, modulation, and perception of pain signals (Cao et al., 2024). Pain begins when noxious stimuli, such as inflammation, distension, or injury to digestive organs, activate visceral nociceptors, which

detect chemical, mechanical, or inflammatory changes. These signals travel via visceral afferent nerves to the spinal cord's dorsal horn and then to the brain through pathways like the spinothalamic and spinoreticular tracts for processing. Repeated injury or inflammation can lead to peripheral sensitization, where nociceptors become overly sensitive, amplifying pain signals even from mild stimuli. Central sensitization in the spinal cord may also occur, heightening neuron responses and causing hyperalgesia or increased pain perception despite reduced stimuli (Aguilera-Lizarraga, 2022).

Several factors, including age, gender, culture, anxiety, previous pain experiences, coping styles, and family and social support influence pain (Campbell et al., 2020). Biological factors such as sex hormones are considered to be one of the primary mechanisms explaining gender differences in pain perception (Pieretti et al., 2016). Regarding anxiety, acute pain often induces anxiety, which in turn amplifies fear. Anxiety is triggered by a perceived threat or the anticipation of one, heightening attention toward the stimulus and resulting in physiological arousal and avoidance behaviors. Anxiety related to pain prompts individuals to steer clear of the triggering stimulus and to overreact to the associated physical sensations (Kwon et al., 2022). Several previous illnesses are factors that affect the level of pain. Some evidence suggests that patients who frequently experience pain will experience lower pain intensity (Coates et al., 2023). The patient's coping mechanism aligns with the pain level the patient feels. Patients with suitable coping mechanisms will feel less pain (Monroe et al., 2024). Family and social support can explain when a patient experiences pain and needs hospital treatment. If it happens continuously, the patient loses control and is unable to control the environment, including pain. Belief and religion can provide comfort in praying, providing much strength to overcome the discomfort (Campbell et al., 2020). Various studies have examined warm compress therapy for pain management, but differences in techniques and results persist. This systematic review aims to explore the application of warm compress therapy for various types of pain across different cases, providing valuable insights for healthcare workers in managing pain effectively.

METHOD

Design and Search Methods

This study used a systematic review method. The search procedure was carried out through Google Scholar, Pubmed/NCBI, ScienceDirect, and Cochrane library databases from 2014 to 2024 for English-based full-text study articles using specific keywords, including "warm compress therapy," and "heat therapy," "Pain" and "RCT." We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method for article selection (D Pati et al, 2018).

Inclusion and Exclusion Criteria

Inclusion criteria are based on PICOS, namely P (Pain patients), I (Intervention in the form of warm compress therapy), C (Presence of a control group as a comparison), O (Decreased pain score), and S (Randomized Controlled Trial).). Exclusion criteria are observational studies, study protocols, review articles, articles with problem topics unrelated to heat therapy or warm therapy on patient pain, and articles based on literature review/systematic review/meta-analysis.

Screening

The first author performed the initial screening, and the other authors performed the screening for content analysis.

Data Extraction
Data were extracted in tables containing authors, participants, design, interventions, and outcomes.

Quality Assessment
We use the JBI Critical Appraisal Skills Program to assess the quality of research articles.(Barker et al., 2023)

Data analysis
Thematic analysis was used to analyze data, with the following steps: 1) understanding the data, 2) identifying codes, 3) identifying themes from codes, 4) refining themes, and 5) defining themes.

Search Results
We generated 532 articles from Google Scholar, 271 from PubMed, 254 from Science Direct, and 2 from the Cochrane Library. The first title and abstract screening were performed, and 704 articles were excluded due to duplicates and inconsistencies in years. Finally, 9 articles were included (See Figure 1). Of the ten articles, one studied pain in cystoscopy patients, five in childbirth patients, one on osteoarthritis pain patients, one on cardiac patients with headaches, one on pain due to phlebitis, and one on cancer pain.

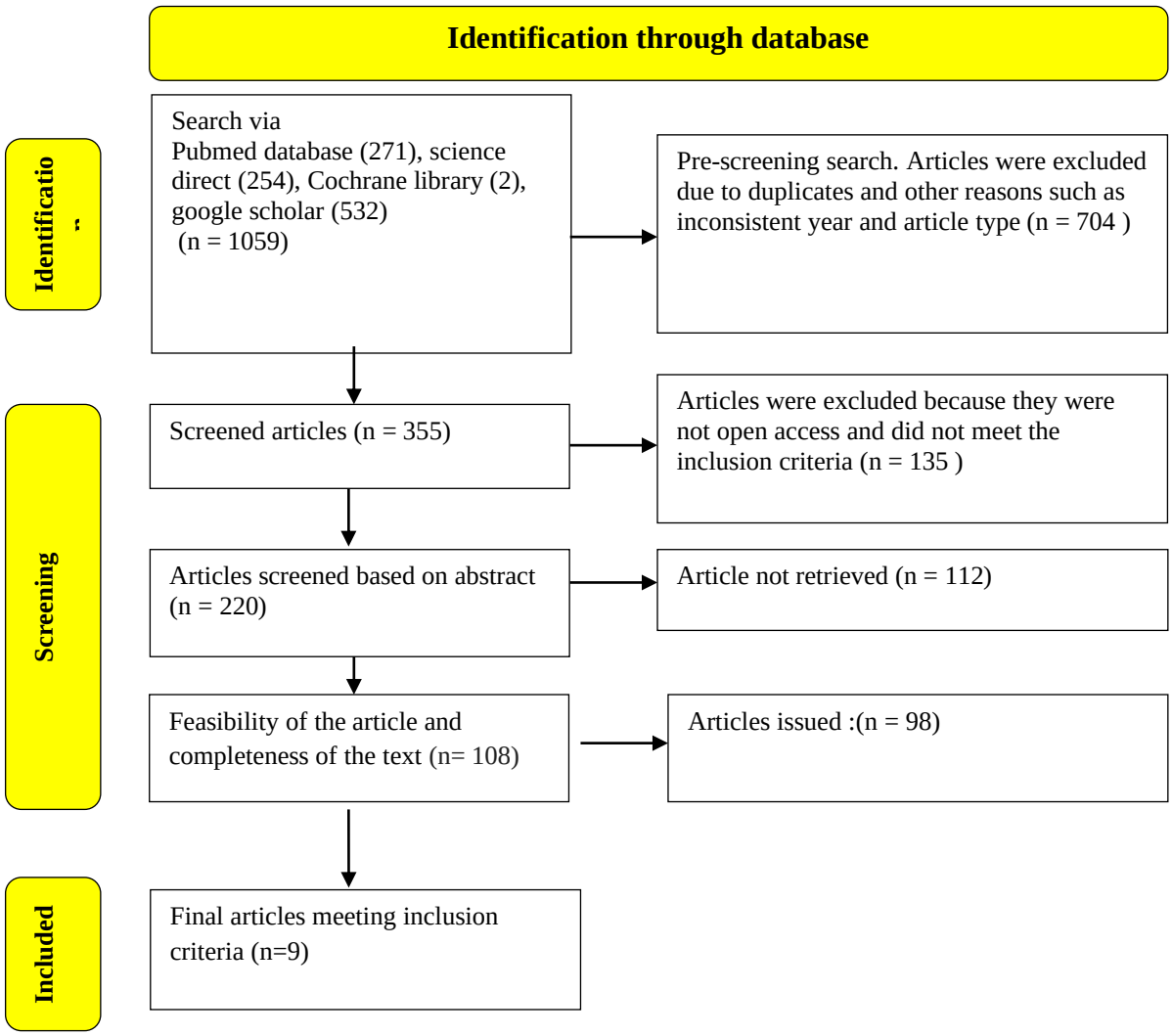

Figure 1. PRISMA Search Flow

RESULT

Table 1
Characteristics of eligible literature

No	Researchers and year of publication	Research design	Intervention	Samples and sampling techniques	Results
1.	(Kwon et al, 2022)	*Single-blinded, single-center, randomized controlled trial.*	145 participants who underwent cystoscopy between August 2017 and October 2017 were recruited and randomly assigned to the control group, experimental or control. Before and after cystoscopy, all participants self-reported their level of pain, which trained nurses objectively assessed. Pain measurement used a combined *numeric rating scale* and *face rating scale instrument.*	*Randomly assigned to an experimental or control group*	A Chi-square test is used for normally distributed data, while the Kolmogorov-Smirnov test checks normality. Since the data is not normally distributed, the Mann-Whitney test is applied. ANCOVA analyzes covariate transformation. Results ($p < 0.01$) indicate that heating therapy during cystoscopy is a comfortable and practical nursing intervention, reducing pain and anxiety while improving patient satisfaction. Objective pain levels were significantly lower in the intervention group than in the control group
2.	(Farahmand, 2020)	*Randomized clinical trial*	A total of 150 participants of mothers who gave birth vaginally. 75 cases in each intervention and control group. Measurement using *a visual analog scale (VAS Mc Gill).*	*Purposive sampling*	According to the results of the t-test, pain intensity in the intervention group was significantly lower than in the control group in the first two stages of labor ($p <0.001$) and on the day after delivery ($p <0.001$). The results showed that bi-stage warm compresses effectively reduced pain intensity in the first two stages of labor and after. Thus, this method can be used to reduce labor pain in addition to pain due to episiotomy after delivery.
3.	(Cai, 2018)	*Comparative randomized trial*	A total of 62 patients (age range 39–82 years) diagnosed with malignant tumors and suffering from cancer-related pain were randomly divided into a treatment group (group A) and a control group (group B). The pain was assessed using the *visual analog scale (VAS)*	*Purposive sampling*	Chi-square analysis was used to analyze the intervention group and control group. Significant differences in clinical pain relief efficacy at various sites were found in group A after treatment vs before treatment ($P<.05$). Application of CMWC on the back meridian combined with WHO 3-step analgesic ladder treatment is effective in relieving cancer-related pain
4.	(Ho, 2021)	*Randomised controlled trial*	76 patients with knee osteoarthritis were diagnosed by experienced orthopedic surgeons. After inclusion and exclusion selection, patients were randomly allocated into group 1 (Heat pack) or group 2 (Thermal gun). All patients received treatment for 30 minutes in each session twice a week for 4 weeks.The pain was assessed using the *visual analog scale (VAS)*	*Purposive sampling*	An independent T-test was used to compare the differences between baseline and same session and to compare between groups. Combining focal thermal therapy on acupressure points is a feasible conservative treatment for knee OA. Pressure on acupressure points has synergistic benefits compared to topical thermal therapy alone. The thermal gun is more portable, regulates body temperature, and is easier to use than topical thermal heat packs.

No	Researchers and year of publication	Research design	Intervention	Samples and sampling techniques	Results
5.	(Bagherzadi, 2020)	*Randomised controlled trial*	25 samples were allocated to each group experiment and 25 for the control group. Participants in all three research groups were asked to complete a patient information questionnaire before intervention. Headache intensity was measured by NRS pain in three study groups 3 times (just before the study, at the end of the first therapy application, and the end of the second therapy application)	*Purposive sampling*	The chi-square test, one-way ANOVA, and repeated measures were used to evaluate statistical significance. There was a statistically significant difference in the average headache intensity at different times (p=0.000). The ANOVA results showed that the average headache intensity at the first to second intervention significantly differed between the heat therapy, cold therapy, and control groups (p=0.022), indicating that both heat and cold therapy effectively reduced headache intensity.
6.	(Didevar, 2022)	*Randomised controlled trial*	99 primiparous women were purposively selected from a teaching hospital in Iranshahr, Iran. Participants were randomly allocated into HT, CT, and control groups by simple randomization. Participants in the HT group received HT using a warm water bottle at a temperature of 38°C– 40°C, and participants in the CT group received CT using ice packs at a temperature of 0°C– 5°C. HT and CT were applied to the lumbar area in the first labor phase and the perineum and suprapubic areas in the second phase.The pain was assessed using the *visual analog scale (VAS)*	*Purposive sampling*	Data analysis was performed using the Chi-square test, one-way analysis of variance, and repeated measures analysis of variance. The results showed that cold therapy was more significant than heat therapy and the control group. Heat therapy had no significant difference from the control group. Heat therapy significantly decreases labor pain in the first stage of labor.
7.	(Hajiabadi, 2023)	*Single-blind clinical trial study*	90 children with phlebitis were selected as participants in this study. Then, they were divided into three groups: the control group, the aloe vera compress group, and the warm compress group.The pain was assessed using the *Wong-Baker Faces Pain Rating Scale*	*Convenience sampling*	The results of statistical tests using the chi-square test, independent samples t-test, one-way analysis of variance (ANOVA), and Fisher's exact showed a p-value of less than 0.05 ($P < 0.05$). This means aloe vera and warm compresses effectively reduce pain scores in phlebitis patients. However, aloe vera compresses are more effective than warm compresses in reducing pain in phlebitis patients.
8.	(Akbarzadeh, 2018)	*Randomized clinical trial*	In the first and second stages of labor, 150 mothers giving birth in the second stage (75 subjects in each group) were given 2 warm compresses with 15-20 minutes duration. Meanwhile, the control group received routine care as usual. Then, the duration of pain was measured using *a visual analog scale* (VAS)	*Simple purposive sampling*	Based on the chi-square test shows that there is a difference in the duration of pain between the control group and the intervention group in the first and second stages of labor. In addition, warm compress action is insignificant and does not affect neonatal APGAR scores.

No	Researchers and year of publication	Research design	Intervention	Samples and sampling techniques	Results
9.	Modoor, 2021)	*Randomized controlled trial post-test only design.*	100 primigravida pregnant women were divided into 50 intervention groups and 50 control groups.Then, the duration of pain was measured using *Numeric Rating Scale (NRS*	*Purposive Random Sampling*	A statistical test using chi-squared tests showed that pain in the perineum area after delivery was statistically significant between the intervention and control groups (p = 0.001). Perineal tears were also significantly different in both groups (p = 0.001).

DISCUSSION

The review shows that all studies used a randomized controlled trial design. The study articles are open-access articles. The study was conducted from 2014 to 2024. All study articles are studies conducted abroad and are written in English. All study articles contain interventions on the effect of warm therapy on pain patients with various methods and tools. Pain is the most common symptom of patients coming to health care units caused by various diseases and trauma (Todd, 2017). Implementing nursing interventions to overcome patient pain in hospitals is still not optimal. Nurses focus more on pharmacological treatment for patients, such as injection of analgesic drugs and oral drugs, rather than conducting non-pharmacological interventions. If pharmacological and nonpharmacological techniques are combined, they can provide more effective treatment in reducing pain in patients (Sakamoto et al., 2018). One of the non-pharmacological actions often performed by nurses is a warm compress. A warm compress uses fluids and tools to provide a warm sensation to the skin and to the body part that needs it. Several studies have shown that warm compress therapy is very effective in reducing pain scores in patients with pain.

The first study was conducted in South Korea by Kwon et al. (2022), which showed that warm therapy performed on 145 patients undergoing cystoscopy can reduce pain and anxiety scores. This study evaluated heat therapy on patients undergoing cystoscopy, an invasive diagnostic procedure. In a trial with 145 participants, the experimental group received heat therapy with warm pads, while the control group did not. Heat therapy significantly reduced pain, anxiety, and physiological stress (e.g., blood pressure and heart rate), with female participants reporting higher satisfaction. The findings highlight heat therapy as a simple, cost-effective, non-pharmacological intervention that improves comfort and well-being during cystoscopy. Its ease of use and effectiveness make it valuable to routine care, enhancing patient experiences and healthcare quality for invasive procedures.

Subsequent studies have shown that warm compress therapy can reduce pain in patients giving birth. Several of these studies include those conducted by Farahmand et al. (2020). This study evaluated bi-stage warm compress therapy on labor pain in first-time mothers. Among 150 participants, the intervention group received warm compresses at 7 cm and 10 cm cervical dilation for 15–20 minutes, while the control group received standard care. The intervention group showed significantly lower pain levels during labor and postpartum ($P<0.001$) and lower episiotomy rates (45% vs. 68%, $P<0.001$). Warm compresses improved perineal tissue elasticity, reducing incision needs and postpartum issues. The study highlights bi-stage warm compress therapy as a safe, economical, and effective non-pharmacological method to enhance maternal comfort and recovery during childbirth.

Akbarzadeh et al. (2018) showed that the effect of warm compress therapy reduced pain scores during the first and second stages of labor. This clinical trial evaluated two-staged warm compresses on labour pain, duration, and neonatal outcomes in 150 primiparous women. The intervention group received warm compresses at 7 cm and 10 cm cervical dilation, while the control group received standard care. The second stage of labour was

significantly shorter in the intervention group (p = 0.05), but there was no difference in the first stage. Neonatal outcomes, including Apgar scores, were similar between groups. Warm compresses enhance blood flow, relax muscles, and provide psychological comfort, offering a safe, cost-effective method to improve maternal labour experiences. Research on the effect of warm compress therapy on reducing pain scores in patients giving birth was also conducted by Didevar et al. (2022) and Dastjerd et al. (2023), which showed that warm therapy also reduced pain levels in primiparous patients during labour. This study evaluated infrared belts and hot water bags for reducing labour pain during the first stage of childbirth. Among 136 participants, divided into infrared belts, hot water bags, and control groups, heat therapy was applied at 4–5 cm and 6–7 cm cervical dilation. Both methods reduced pain, but the infrared belt showed significantly greater effectiveness (P<0.001). Additionally, 86% of women in the infrared belt group rated their experience as "very good," compared to 56.8% in the hot water bag group. The study concludes that infrared belts are safe, effective, and enhance maternal comfort during labour (Dastjerd et al., 2023).

The subsequent study evaluates the effectiveness of heat therapy (HT) and cold therapy (CT) in managing labour pain (LP) intensity among primiparous women. This randomized controlled trial studied 99 participants divided into heat therapy (HT), cold therapy (CT), and control groups. HT used warm compresses (38°C–40°C), and CT applied cold packs (0°C–5°C) to lumbar, perineal, and suprapubic areas during active labour. The pain was measured using the Visual Analog Scale at five time points. CT significantly reduced pain at 8–9 cm cervical dilation compared to HT and control, while HT showed no significant difference. CT's effectiveness aligns with the gate control theory. The study concludes that CT is a cost-effective, non-pharmacological method for managing labor pain (Didevar et al., 2022). Modoor et al. (2021) studied the effectiveness of warm compresses in reducing perineal tears and pain during childbirth. The study involved 100 primigravida women randomly divided into intervention (50) and control (50) groups. Warm compresses were applied during the second stage of labor, and data were analyzed using chi-square tests, with significance set at p < 0.05. Results showed that warm compresses significantly reduced second and third-degree perineal tears and decreased pain intensity during labor and postpartum. This research highlights warm compresses as an effective, non-invasive method for improving maternal outcomes during childbirth (Modoor et al., 2021).

Research conducted by Ho et al. (2021) The effectiveness of warm compresses in the form of thermal guns on acupressure points can reduce pain in patients with osteoarthritis. A randomised study assessed focal thermal therapy at acupressure points versus conventional heat pack treatment for knee osteoarthritis. Participants were assigned to either method and treated for four weeks alongside a home exercise regimen. Outcomes revealed that the thermal gun group had notable gains in functionality, quadriceps strength, and quality of life. Conversely, the heat pack group showed better knee flexion improvements. Pain reduction was more consistent in the thermal gun group. The findings suggest that combining thermal therapy with acupressure is a promising, non-invasive alternative for managing knee osteoarthritis.

In addition, warm compresses can also reduce pain in pediatric patients with phlebitis. However, aloe vera is more effective than warm compresses in reducing phlebitis pain (Hajiabadi et al., 2023). This trial evaluated Aloe vera and warm compresses for reducing phlebitis pain in hospitalized children aged 3–8. Ninety participants were divided into three groups: Aloe vera compress, warm compress, and control. Aloe vera gel (5 cc) and warm compresses (37–38°C) were applied twice daily for three days. Pain was measured using the Wong-Baker Faces Pain Rating Scale. Aloe vera and warm compress groups showed

significant pain relief by day two, with Aloe vera showing superior results on day three (p = 0.03). Aloe vera's anti-inflammatory properties and warm compresses' effect on circulation make them safe, effective, non-pharmacological treatments.

Research conducted by Cai et al. (2018) also proved that warm compresses from China are effective in reducing pain in patients diagnosed with malignant tumours or cancer. This study assessed the effectiveness of Chinese Medicine Warm Compress (CMWC) combined with the WHO's 3-step analgesic ladder for cancer pain management. Sixty-two patients (ages 39–82) were divided into two groups: standard therapy and therapy with additional CMWC applied to the back meridian for two weeks. Results showed the CMWC group had significantly lower pain scores, a higher Overall Response Rate (70.97% vs. 29.03%), reduced analgesic use, fewer side effects (e.g., constipation), and improved Quality of Life (QOL). By enhancing qi flow and blood circulation, CMWC amplified treatment effects, proving to be a safe, effective complementary therapy that improves oncology patient care.

Research conducted by Bagherzadi et al. (2021) proved that warm compresses can reduce headaches or migraines in heart patients. This study explored heat and cold therapy for managing nitroglycerin-induced migraines in cardiac patients. Seventy-five participants were divided into heat therapy, cold therapy, and control groups. Intervention groups received two 25-minute sessions an hour apart, while controls received standard care. Headache intensity was measured pre-intervention, after the first session, and after the second session. Both therapies significantly reduced headache intensity compared to the control group (p=0.000), with heat therapy showing slightly greater effectiveness after the second session. The findings support heat and cold therapy as safe, non-drug options for alleviating migraines and enhancing comfort during nitrate treatments. These studies prove that warm compress or heat therapy reduces pain scores in patients with several conditions. In addition, warm compress therapy can reduce anxiety (Hur & Choi, 2021). On the other hand, warm compress also improves blood circulation and relaxes muscles (Royhanaty et al., 2022.). This can be an option for health services to provide patients with non-pharmacological therapy. So that the service gets better and patient satisfaction increases.

CONCLUSION

Based on all the articles reviewed related to pain management with warm compresses, the results of all interventions in all the articles reviewed statistically proved that warm compress therapy effectively reduces pain scores in patients with various complaints. Besides that, it can also relax muscles and improve tissue perfusion (Hotfiel et al., 2024). (Park et al., 2020) explained that therapy can increase blood flow and connective tissue extensibility. Several interventions obtained from ten articles are effective in reducing pain scores. Health workers should consider including warm compress therapy in the treatment plan for patients with primary pain complaints.

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