

## ORIGINAL ARTICLE

# The effect of cold application on episiotomy pain: A systematic review and meta-analysis

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## Abstract

**Aims and Objectives:** To evaluate the effectiveness of cold application methods in reducing postpartum episiotomy pain.

**Background:** Many women suffer from pain after giving birth due to an episiotomy. This prolonged pain affects their daily lives as they recover. Various methods can help alleviate this pain; however, the effects of cold application specifically are still under discussion.

**Design:** Systematic review and meta-analysis were used.

**Methods:** In this review, we investigated studies from the CINAHL, PubMed, Google Scholar and Science Direct databases that met PICOS inclusion criteria. We also assessed the studies' methodological quality with the JADAD and JBI checklists. This study was performed based on the Guidelines of Systematic Reporting of Examination presented in the PRISMA checklist (Appendix S1). The search protocol has been registered at the PROSPERO International Prospective Register of Systematic Reviews.

**Results:** A total of seven published studies including 700 total participants were included in this review. Various cold application methods (cold gel pack/pad, crushed ice gel pad, ice pack) significantly reduced the pain after an episiotomy. Ice packs in particular did not significantly differ from lavender oil and acupressure in reducing pain after an episiotomy.

**Conclusions:** Cold application methods can be an effective, non-pharmacological midwifery and nursing intervention to reduce pain after an episiotomy.

**Relevance to clinical practice:** The use of cold application methods to reduce pain after episiotomy may reduce the need for pharmacological medication in women due to the reduction in pain in the perineum.

## KEYWORDS

cold application, episiotomy, episiotomy pain, midwife, nursing

## 1 | INTRODUCTION

An episiotomy is a surgical incision performed on the bulbo cavernous muscle in the perineum while a baby's head is birthed to protect the tonus of the perineum, prevent unwanted tears and facilitate

childbirth. The perineum is a very sensitive area comprised of muscles related to sitting, walking, bending, crouching, urinating and defecation. For this reason, any trauma caused in this region due to an episiotomy has mental, social and physical effects on women (Başgöl & Beji, 2015; Jiang et al., 2017; Navvabi et al., 2011; Yanık & Ertem,

2020). Perineal pain can be caused by surgical (episiotomy) and spontaneous trauma and lacerations after vaginal birth. Episiotomies represent one form of trauma and are equivalent to a second-degree laceration that affects the mucosa and perineal muscles. First- and second-degree lacerations cause pain and unrest, which puts extra stress on mothers who are trying to adapt to their new conditions and thus negatively affects their daily activities (Beleza et al., 2017; Maha et al., 2017).

Episiotomy pain negatively affects daily activities such as movement, urination, defecation and lactation, especially during the first 3 days postpartum (Yanik & Ertem, 2020). In previous studies, 20–25% of women felt pain in the perineal region that

### What does this paper contribute to the wider global community?

- Using cold application methods to reduce pain after episiotomy may reduce women's need for pharmacological drugs due to the reduction in pain in the perineum.

lasted for the first 2 weeks after giving birth and undergoing an episiotomy, and 10% felt it for at least 3 months (Beleza et al., 2017; Ghosh et al., 2004). The main goal then is to improve quality

**TABLE 1** Characteristics of article analysed in the study

Author (year)	Country	Study design	Participants					Type
			n	Pregnancy	Mean age (years)	Treatment group		
Bini Solomon and Ahitha (2019)	Indian	QRT	Exp:30 Con:30	P or M	Not presented	Cold application vs no application	Cold application Not presented	
Geetha and Shankar (2014)	Indian	RCT	Exp:30 Con:30	P	Not presented	Ice package vs routine care	Ice package Not presented	
Maha et al. (2017)	Egypt	QRT	Exp:52 Con:52	P or M	Exp:24.82 ± 3.75 Con:25.09 ± 4.0	Cold gel pack vs routine care	Cold gel pack Clean the perineum	
Şolt and Gül (2020)	Turkey	RCT	Exp1:40 Exp2:40 Con:40	P or M	Exp1: 28 ± 4.20 Exp2:28.4 ± 3.82 Con: 27.8 ± 3.65	Acupressure vs ice package vs routine care	Acupressure Ice package Not presented	
El-Saidy et al. (2018)	Egypt	QRT	Exp:100 Con:100	P	Exp:25.8 ± 5.8 Con:27.8 ± 5.7	Crushed ice gel pads vs routine care	Crushed ice gel pads Wash hands before and after each perineal care	
Minov (2017)	Turkey	QRT	Exp1:31 Exp2:32 Con:33	P	Not presented	Ice package vs. Levantina vs. no application	Ice package Levantina Not presented	
Sheikhan et al. (2011)	Iran	RCT	Exp1:30 Con:30	P	Exp:22.67 ± 3.93 Con:23.47 ± 4.14	Cold gel pad vs. routine care	Gel pad warm sitz bath with betadine	

Abbreviations: Con, control group; Exp, experimental group; JADAD, scale for reporting randomised controlled trials; JBI, critical appraisal checklist for quasi-experimental studies; M, multipara; P, primipara; QRT, quasi-randomised (non-randomised controlled trial); RCT, randomised controlled trial; REEDA, redness, oedema, ecchymosis, discharge, approximation; VAS, visual analogue scale.

of life by reducing the rate of analgesic use in the treatment of pain (Yanık & Ertem, 2020).

Among these non-pharmacological methods, cold application is important in reducing perineal pain (Beleza et al., 2017). Cold application methods have been used for years to treat local tissue traumas to reduce short-term pain (Beleza et al., 2017; Maha et al., 2017; Navvabi et al., 2011). Cold application comes in different forms, such as ice packs, cold gel pads or cold/ice baths, to treat perineal lacerations (Leventhal et al., 2011). Cold application constitutes a non-pharmacological, non-invasive, low-cost and simple method to reduce local tissue temperature and also help reduce pain after an episiotomy (Şolt & Gül, 2020; Vargens Octavio et al.,

2013). Although the physiopathology of the cold application employed in reducing post-episiotomy pain is not clearly known, research has found that it causes vasoconstriction. It also reduces capillary permeability and prevents oedema from occurring in the region by preventing blood from damaged vessels from leaking into tissues (Beleza et al., 2017; Vargens Octavio et al., 2013). As a result, cellular metabolism decreases and muscles loosen, which together reduce pain (Beleza et al., 2017; Vargens Octavio et al., 2013). Additionally, cold application methods can reduce skin temperature by 10–15°C in 15 min, thus slowing down bacterial growth, numbing the area, slowing pain stimuli and reducing inflammation and pain by increasing the pain threshold (Bini Solomon

Intervention					
Frequency and duration	Start time	Measurement time	Outcome measure	Outcomes	Quality
For 15–20 min twice a day for 2 days	Not presented	Day 1 and Day 2: Before intervention, after cold application	Wong Baker Faces pain rating scale	Cold application is an effective non-pharmacological intervention for reducing episiotomy pain among postnatal mothers.	JBI 7/yes 2/unclear
For 15–20 min twice a day both in morning and the evening at an interval of 10 h for 2 days	Within 5 h after delivery	Day 1 and Day 2: Before intervention, 30 min after ice package	Modified verbal descriptor scale	The ice package application was very effective in reduction of pain in episiotomy wound among postnatal mothers.	JADAD:1 point
For 20 min	Immediately 2 h and 4 h after delivery,	Day 1: Before intervention, 2 h and 4 h after cold gel pack	VAS	Episiotomy pain for study group (cold gel pack) was relieved better than control group (Routine care)	JBI 8/yes 1/no
For 10 min once	30 min after the delivery	Day 1: Before intervention, immediately after, 30th, 60th and 120th min after ice package	VAS	Comparing three methods (acupressure, ice package, routine care) the acupressure and the ice package has significantly reduced pain than routine care.	JADAD: 3 point
For 20 min	After birth by 30 min to an hour.	At the first day after birth, Postpartum 3 days and postpartum 7 days	McGill pain scale REEDA	Crushed ice gel pads are safe and effective to reduce pain and improve episiotomy wound healing	JBI 8/yes 1/no
For 10 min	It started at the postpartum 2nd hour and was applied every 3–4 h.	Before intervention, 2nd hour, 14th hour and before discharge	VAS REEDA	According to the results; lavender oil and ice application reduce episiotomy pain and accelerate the healing.	JBI 8/yes 1/no
For 20 min twice a day	Not presented	Before intervention, 4 h, 12 h and 5 days after episiotomy	VAS REEDA	There was statistically difference in pain intensity scores of two groups in 4 h, 12 h and 5 days after episiotomy. Applying cold gel pads is an affective non-invasive method of reliving discomforts.	JADAD:1 point

& Ahitha, 2019; Geetha & Shankar, 2014; Leventhal et al., 2011; Maha et al., 2017; Rasha et al., 2016; Şolt & Gül, 2020). This in turn helps women return to their normal activities faster and increase their comfort during the postpartum period (Bini Solomon & Ahitha, 2019). Ice packs in particular are used in many developed countries to reduce trauma-related perineal pain in the postpartum period (Francisco et al., 2018; Navvabi et al., 2009).

There are many experimental studies in the literature that examine cold application's effects on perineal pain as a non-pharmacological method (Abedian et al., 2007; Beleza et al., 2017; Francisco et al., 2018; Jahdi et al., 2010; Leventhal et al., 2011; Lu et al., 2015; Mahishale et al., 2013; Navvabi et al., 2009; Oliveira et al., 2012; Senol & Aslan, 2017; Steen & Marchant, 2007; Yusamran et al., 2007). There is also a systematic review study that evaluates the effects of cold application methods on perineal pain (East et al., 2012). However, limited studies examine the effects of cold application on episiotomy pain alone or with different methods, and there are no systematic reviews on this topic (Bini Solomon & Ahitha, 2019; El-Saidy et al., 2018; Geetha & Shankar, 2014; Maha et al., 2017; Sheikhan et al., 2011; Şolt & Gül, 2020).

For this reason, the aim of the present study was to evaluate the effectiveness of cold application methods (i.e. cold gel packs, crushed ice gel pads, ice packs and cold gel pads) in the treatment of pain after an episiotomy during vaginal deliveries apart from perineal lacerations.

## 2 | METHODS

Registry for this study was obtained from PROSPERO (Number: CRD42020196333). When authors registered Prospero, they only have thought of getting articles using ice packages reducing for episiotomy pain for the study. But later they decided this would limit the study too much. That's why they updated the keywords in the study, changed the article's title but the study protocol has not been changed.

Our study selection criteria were based on the core PICOS (Participants, Intervention, Comparison, Outcomes, Study type) question format from the PRISMA checklist (Preferential Reporting Items for Systematic Reviews and Meta-Analyses; Moher et al., 2015; Appendix S1, Table 1). The key question for the search was, 'Are cold application methods (cold gel pack, crushed ice gel pad, ice pack or cold gel pad) effective in reducing pain after episiotomy compared to no cold application?'. The studies' participants (P) were primi- or multiparous women who underwent an episiotomy during vaginal birth (and who had an episiotomy in their previous birth(s) if applicable). The intervention groups (I) received a pharmacological treatment alongside a non-pharmacological cold gel pack, crushed ice gel pad, ice pack or cold gel pad or only a non-pharmacological cold gel pack, crushed ice gel pad, ice pack or cold gel pad for their episiotomy wound. The comparative groups (C) underwent routine hospital protocol treatment and other alternative methods (lavender oil or acupressure). The outcome (O) was a pain level assessment

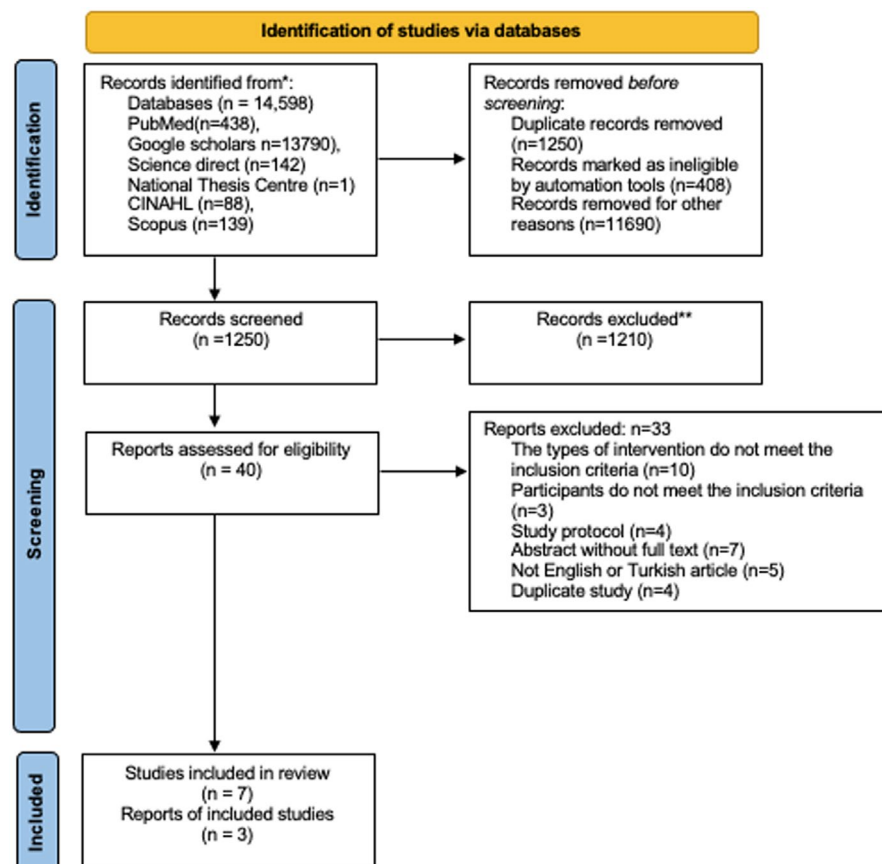


FIGURE 1 Prisma flow diagram of study selection process [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

with the following measurement tools: the visual analogue scale (VAS), Short McGill Pain Scale, Wong Baker Faces Pain Rating Scale and Modified Verbal Descriptor Scale. Lastly, the study types (S) were randomised clinical trials (RCTs) or quasi-randomised studies (non-randomised controlled) on published human subjects that occurred before 1 July 2020.

## 2.1 | Search strategy and study selection

We searched the following Turkish and English databases with the Internet access networks of Kırklareli University and Kırşehir Ahi Evran University: YOK National Thesis Center, CINAHL, Scopus, PubMed, Google Scholar and Science Direct. Additionally, we electronically scanned the sources in the reference lists of the studies from these databases.

The international databases were accessed using the keywords: "episiotomy", "episiotomy pain", "episiotomy and cold gel pack", "episiotomy and crushed ice gel pad", "episiotomy and ice package", "episiotomy and cold gel pad", and national databases were scanned using the keywords: "epizyotomi", "epizyotomi ağrısı", "epizyotomi ve soğuk jel paketi", "epizyotomi ve buz jeli", "epizyotomi ve buz paketi", "epizyotomi ve soğuk jel pedi" by two authors in the research team (ASK and SKO) and approved by a librarian.

The PubMed screening example: ("pain, episiotomy" [MeSH Terms]) OR ("pain" [All Fields] AND "episiotomy" [All Fields]) OR "episiotomy pain" [All Fields] OR ("episiotomy" [All Fields] AND "pain" [All Fields]).

We completed the first literature review manually with a librarian. Duplicate studies were eliminated using the Mendeley Program in accordance with the PRISMA Systematic Review Flowchart (Moher et al., 2015). In the first step, three reviewers scanned the titles and abstracts of the studies independently. These researchers also checked the studies' full texts and identified the articles that met the selection criteria. Studies that did not have full texts, unexplained methods, observational or animal experiments, or were cold application studies assessing perineal pain that occurs as a result of lacerations that occur spontaneously without an episiotomy were excluded (Figure 1). The study protocol was received by PROSPERO. To reduce the potential bias risks in the systematic review and meta-analysis, the first and second researchers conducted the literature review, article selection, data selection and evaluation of article quality independently, though each of these stages was checked in a session attended by the third researcher to reach a consensus.

## 2.2 | Quality assessment

We assessed the quality of the selected studies with the scale for reporting randomised controlled trials (JADAD) checklist for RCTs (Jadad et al., 1996) and JBI checklist for quasi-randomised trials (JBI Critical Appraisal Checklist for Quasi-Experimental Studies, 2019; Wang et al., 2018).

We employed the JADAD checklist to evaluate the bias risk and quality of the RCT of studies (Jadad et al., 1996). The scale has 3 items (*Describing Randomization, Blinding and Accountability*) with scores ranging between 0–5 points. If a study's JADAD score was  $\geq 3$ , the study was considered to be of high quality, and if it was  $\leq 2$ , the study was considered to be of low quality (Jadad et al., 1996; Zhang et al., 2019).

We also used the JBI checklist to evaluate the quality of the quasi-randomised trials (JBI Critical Appraisal Checklist for Quasi-Experimental Studies, 2019; Wang et al., 2018). This tool is made up of 9 items and determines whether the following criteria appear in a given study: cause-and-error relation; presence of a control group; whether the treatment and control groups underwent the same application; number of variables examined before and after the intervention; definition of the precise monitoring process; whether the variables in the two groups were evaluated with the same measurement; whether appropriate statistical tests were employed; and if general evaluations were done. The options 'YES', 'NO', 'UNCLEAR' and 'INAPPLICABLE' determine whether the criteria are met. Three arbitrators evaluated the articles independently and discussed different ideas among themselves to reach a common consensus. One point was given for the fulfilment of each of the above criteria. Studies scoring between 0–3 and those scoring between 4–6 were considered to be of low and moderate quality, respectively. If a study scored 7 or higher, it was considered to be of high quality (JBI Critical Appraisal Checklist for Quasi-Experimental Studies, 2019; Wang et al., 2018).

## 2.3 | Data collection and statistical analysis

We extracted the following data from the selected articles: author, year of publication, country, study design, number of samples, mean participant age (years), treatment (type, frequency and duration, start time, measurement time), outcome measurement tool and outcomes (Table 1).

A single author encoded the data, and two other authors checked the data twice; incompatible data were reviewed and revised. The statistical analyses, effect sizes and heterogeneity analyses were made in Comprehensive Meta-Analysis (version 3; Biostat, Englewood, NJ, USA). Effect size was determined with Hedges's  $g$  (Hedges & Olkin, 1985), a statistic that assigns weight based on the standardisation of the results obtained with various measurement tools and the number of samples in the study. We used a random effect model to consider the differences in subjects, intervention methods, durations and measurement tools in the included studies. Heterogeneity analyses are made by examining Tau,  $I^2$ ,  $H^2$ ,  $Q$  values. The present study heterogeneity was evaluated with the chi-square test. Higgin's  $I^2$  test was used when significant heterogeneity was detected;  $I^2$  values indicated low (25–50%), moderate (51–75%) or high (> 75%) heterogeneity (Higgins & Green, 2011; Pigott, 2012).

We determined that the present study had not a heterogeneous structure as a result of the values obtained from the meta-analysis studies. In this respect, we used a random effect meta-analysis because the heterogeneous structure and  $I^2$  value were 97%.

### 3 | RESULTS

#### 3.1 | Search findings

We obtained a total of 14,598 studies in our initial database search. After removing duplicates and screening titles and abstracts, we examined the full texts of 40 studies, of which 7 (3 RCTs and 4 quasi-randomised trials) were included. In the end, we included 3 studies (276 women) published in English in the final review and meta-analysis (Figure 1).

#### 3.2 | Study characteristics

The study authors were from Iran (Sheikhan et al., 2011), India (Bini Solomon & Ahitha, 2019; Geetha & Shankar, 2014), Egypt (El-Saidy et al., 2018; Maha et al., 2017) and Turkey (Minov, 2017; Şolt & Gül, 2020). The studies evaluated a total of 700 participants in RCTs and quasi-randomised trials. The mean participant age varied between 22.67–28.4 years in each study. The participants were primi- or multiparous and experienced term childbirth with episiotomies. The cold application types were ice packs (Geetha & Shankar, 2014; Minov, 2017; Şolt & Gül, 2020), cold gel packs/pads (Maha et al., 2017; Sheikhan et al., 2011), crushed ice gel pads (El-Saidy et al., 2018) and cold application methods not otherwise specified (Bini Solomon & Ahitha, 2019).

Two studies used ice packs wrapped in sterile gauze (Minov, 2017; Şolt & Gül, 2020), while 4 studies did not mention these details (Bini Solomon & Ahitha, 2019; Geetha & Shankar, 2014; Maha et al., 2017; Sheikhan et al., 2011). One study described the size and shape

of the gel pad as approximately 5 cm wide, 23 cm long and 1.5 cm thick (El-Saidy et al., 2018), and another study described the ice pack to be approximately 8 cm wide and 16 cm long (Minov, 2017).

The initiation of the cold gel pack, crushed ice gel pad, ice pack or cold gel pad application in 2 studies was 30 min after birth (El-Saidy et al., 2018; Şolt & Gül, 2020); not presented in 2 studies (Bini Solomon & Ahitha, 2019; Sheikhan et al., 2011); at the second and fourth hours after birth in 2 studies (Maha et al., 2017; Minov, 2017); and within the fifth hour after birth in 1 study (Geetha & Shankar, 2014). The application duration in 3 studies was twice for 15–20 min (Bini Solomon & Ahitha, 2019; Geetha & Shankar, 2014; Sheikhan et al., 2011), 20 min in 2 studies (El-Saidy et al., 2018; Maha et al., 2017), and 10 min in 2 studies (Minov, 2017; Şolt & Gül, 2020).

None of the studies mentioned the negative effects of applying cold gel packs, crushed ice gel pads, ice packs or cold gel pads. Pain was measured with the VAS in 2 studies (Maha et al., 2017; Şolt & Gül, 2020); with the VAS and REEDA scale (Redness, oedema, ecchymosis, discharge, approximation) in 2 other studies (Minov, 2017; Sheikhan et al., 2011); with the Short McGill Pain Scale and REEDA scale in 1 study (El-Saidy et al., 2018); with the Modified Verbal Descriptor Scale in 1 study (Geetha & Shankar, 2014); and with the Wong Baker Faces Pain Rating Scale in 1 study (Bini Solomon & Ahitha, 2019).

#### 3.3 | Results

Seven papers (Bini Solomon & Ahitha, 2019; El-Saidy et al., 2018; Geetha & Shankar, 2014; Maha et al., 2017; Minov, 2017; Şolt &

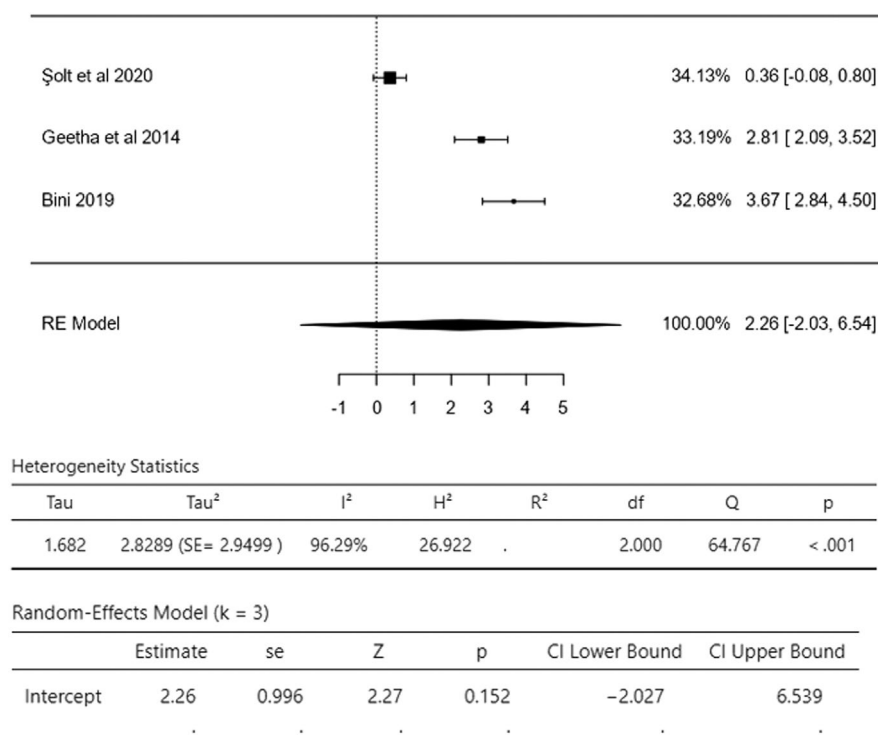


FIGURE 2 Meta-analysis outcomes (random-effects model)

Gül, 2020) reported that cold application effectively reduces pain after an episiotomy. They reported that the time to achieve effective pain reduction with local cold application was immediately after childbirth or 30 min, 1 h, 2 h, 4 h, 12 h, 24 h, 2 days, 3 days, 5 days or 7 days after the episiotomy. Since the studies included in this review used different cold application methods and evaluated pain at different times, each study showed different effective times.

### 3.3.1 | Effects of cold application (cold gel pack, crushed ice gel pad, ice pack and cold gel pad) versus other treatments (acupressure, lavender oil and routine care)

A total of 7 studies (Bini Solomon & Ahitha, 2019; El-Saidy et al., 2018; Geetha & Shankar, 2014; Maha et al., 2017; Minov, 2017; Sheikhan et al., 2011; Şolt & Gül, 2020) utilised cold gel pack, crushed ice gel pad, ice pack and cold gel pad applications together with routine care, acupressure, no application and lavender oil applications. Four studies that compared cold application, cold gel pads, cold gel packs and ice packages with routine care showed that cold application was more effective in reducing pain after an episiotomy than routine care (warm sitz bath with betadine or cleaning the perineum or no application) (Maha et al., 2017,  $p < .001$ ; Sheikhan et al., 2011,  $p = .014$ , Geetha & Shankar, 2014,  $p = .029$ , Bini Solomon & Ahitha, 2019,  $p < .001$ ). Minov found no statistically significant differences between the ice pack application and lavender oil groups; however, both methods were more effective in reducing pain after an episiotomy compared with the control group, which did not undergo either treatment (Minov, 2017,  $p < .05$ ). In another study, crushed ice gel pads effectively reduced pain after an episiotomy compared with routine care (washing hands before and after perineal care, removing the soiled pad from front to back, drying the perineal area with dry tissue from front to back) (El-Saidy et al., 2018,  $p < .05$ ). Another study reported no statistically significant differences in pain after an episiotomy between ice pack and acupressure groups though both methods were more effective in reducing pain compared with the control group (Şolt & Gül, 2020,  $p < .05$ ).

Considering the lack of data and our failed attempts to communicate with the authors, we obtained meta-analysis data from only 3 studies that measured pain after an episiotomy (Bini Solomon & Ahitha, 2019; Geetha & Shankar, 2014; Şolt & Gül, 2020). In these studies, ice packs were used after an episiotomy ( $n = 100$ ), and the results were compared with routine care, acupressure and no application ( $n = 140$ ). Considering that most studies performed cold applications at different times (day 1, day 2 or day 5 postpartum), we conservatively followed a random effect meta-analysis, of which the heterogeneous structure and  $I^2$  value were 97%. Additionally, the black diamond in the graphic was located on the zero line, suggesting that the overall effect was not statistically significant (Figure 2). As a result of the Z test, there was not significant effect size ( $Z = 2.27$ ,  $p = .152$ ; Figure 2).

The observed standardised mean differences ranged from 0.3622–3.6740, with the majority of estimates being positive (100%). The estimated average standardised mean difference based on the random effect model was 2.2560 (95% CI:  $-2.0273$ – $6.5393$ ). An examination of the studentised residuals revealed that one study (Şolt & Gül, 2020) had a value larger than  $\pm 2.3940$  and may be a potential outlier in this model's context. According to Cook's distances, none of the studies could be considered overly influential. Unfortunately, symmetry is not provided, as there are 3 studies that can be analysed. Therefore, the regression test indicated funnel plot asymmetry ( $p = .0215$ ), but the rank correlation test did not ( $p = .3333$ ).

## 4 | DISCUSSION

The aim of the present study was to confirm the effects of cold application methods on pain after an episiotomy through a meta-analysis and systematic review. Unlike other reviews that included randomised or quasi-randomised trials (Kim et al., 2020), the present review selected both RCTs and quasi-randomised trials.

The 7 reviewed studies' general effect size was significantly different, and heterogeneity was detected on postpartum day 1 after an episiotomy. Similar systematic examination studies reported a significant decrease in the pain of women who received cryotherapy between 24–72 h after giving births (East et al., 2007; Kim et al., 2020). In the 3 studies included in this analysis, cold application occurred immediately after the episiotomy or 30 min after birth. Additionally, with the varied evaluations of pain changes from minutes to hours after birth, each study showed pain reduction effects up to the seventh day after birth.

The most common cold application methods were gel and ice packs. When we compared their effects, the overall effect size did not differ significantly. Related, when the cold application method involves ice, water must be frozen or crushed ice must be placed in a bag or glove, but a gel pack can be applied immediately if it is frozen. In this way, these cold application methods (i.e. ice and gel packs) might be more convenient and efficient in midwifery. However, since the included studies did not assess cost, future studies should evaluate the cost effectiveness of the materials used for different cold applications. Petersen (2011) reports that gel packs on the market cost \$2.06 each, commercial cold packs \$1.79 each and latex gloves \$0.03 each. Midwives and other healthcare professionals must therefore consider the convenience and cost of gel packs, cold packs and latex gloves (Petersen, 2011).

It was difficult to make conclusions about the results from the comparison of cold and other application methods in reducing pain after an episiotomy because the results were as varied as the interventions compared. However, cold application did not significantly differ from the use of acupressure or lavender oil in terms of reducing pain after an episiotomy. Acupressure is a form of manipulative treatment originating from acupuncture that helps regulate the blood flow in the body so it regains its own balance after chemicals are released into the blood (i.e. beta-endorphins, serotonin,

dopamine and adrenaline; Gao, 1997; Schlaeger et al., 2017; Şolt & Gül, 2020). In this section of the analysis, although only 1 article assessed acupressure, its results showed that cold application is as effective as acupressure in reducing pain. Another article also evaluated lavender oil and similarly found that cold application was as effective as lavender oil in reducing pain.

This systematic review concluded that few studies included detailed data on the diversity and size of the pain-reducing tools and patients' posture during the application. Additionally, the cold application time varied from just a few minutes to over several days, which made it difficult to determine the complete cold application duration. Only 2 studies reported the size and length of the cold application tool as well (El-Saidy et al., 2018; Minov, 2017). Two other studies indicated that the cold application tools were wrapped with sterile gauze (Minov, 2017; Şolt & Gül, 2020).

It was difficult to make any conclusions on the optimum starting point for cold application, as the starting point of the application depended on the condition of the participants in the postpartum period. Cold application methods must also consider the general condition of the participants because there may be other symptoms, such as oedema and bleeding, in the perineal region in the early postpartum period.

Since cold application occurs on the surface of the body, the skin temperature begins to drop within 2–5 min, and instant cooling occurs on the skin. After 20 min, the temperature of the deep muscle tissue, covered with about 2.5 cm subcutaneous fat, drops to approximately 5°C (Kim et al., 2020). Cold application occurred between 10–20 min in the studies included in this systematic review.

Shin et al. (2018) report that cryotherapy participants should be carefully observed for side effects, such as a cold allergy, cold, freezing, headache, vasoconstriction and vasodilation (Shin, 2018). Kim et al.'s (2020) systematic review and meta-analysis of cryotherapy did not investigate the negative effects of cryotherapy except for therapeutic temperature; therefore, caution must be further assessed in cryotherapy studies. Cold application might also cause infection risks when placed directly on the episiotomy site after birth or without cover the gauze (Kim et al., 2020). Midwives, nurses and other healthcare professionals should thus use fresh tools and supplies for each cold application. If a tool is used again, necessary measures must be taken to minimise the risk of infection. Two studies in this systematic review (Minov, 2017; Şolt & Gül, 2020) mentioned that the ice packs were re-applied for each participant but covered with gauze that was indeed changed.

The quality of the 3 RCTs included in this study was evaluated with the JADAD checklist, and the quality of the 4 quasi-experimental studies was measured with the JBI checklist. Many of the included studies raised concerns about bias risks in the randomisation process. However, it was very difficult to blind the participants due to the nature of the application methods. There was also a high risk of bias in measuring the results in many studies. For this reason, the studies' results may have been affected by the assessments of the evaluators, who knew what interventions were conducted with which participants. For this reason, not only participant

randomisation but also study blinding should be further elaborated in the participant evaluations and outcomes of future studies.

Cold application's impacts were heterogeneous in terms of the type and duration of cold application. The cold application tools were cold gel packs, crushed ice gel pads, ice packs and cold gel pads. The initiation of each cold application varied between immediately after childbirth and 30 min, 1 h, 2 h, 12 h, 14 h, 24 h, 3 days, 5 days or 7 days after an episiotomy for 10–20 min, but there were insufficient data on the total application time and frequency. Repeated and expanded studies are thus necessary to establish standardised cold application guidelines in midwifery.

This study's limitations are as follows: due to the insufficient number of studies carried out in line with this review's aim, we included studies with a high risk of bias. The inclusion of studies from last 10 years also constitutes a limitation of this study.

## 5 | CONCLUSION

We conducted this study to determine the effects of cold application methods in midwifery practice on pain after an episiotomy and to make practical recommendations. We found that cold application (i.e. cold gel packs, crushed ice gel pads, ice packs and cold gel pads) initiated immediately after birth or up to 24 h postpartum is effective in alleviating pain and among the most appropriate methods for clinical midwifery and nursing practices. We also found that ice packs in particular are just as effective as lavender oil and acupressure in reducing episiotomy pain. For this reason, cold application can occur on demand under the clinical judgement of midwives, nurses and other healthcare professionals to reduce the pain that occurs after episiotomy with consideration of women's preferences. The results of this study should be applied carefully, though, as the number of articles analysed was quite small. Further studies are needed to confirm the effects of the studies' different cold application methods, their application times and their durations in practice to evaluate their effect on reducing post-episiotomy pain. Additionally, since there were no studies that examined the cold application methods' side effects, further studies are needed in this regard as well.

## 6 | RELEVANCE TO CLINICAL PRACTICE

It is advantageous for women to use cold application methods to reduce pain after an episiotomy, so midwives are recommended to apply cold flexibly or tailor it to individual women's postpartum care progress. Accordingly, women's need for pharmacological medication may decrease due to the reduced pain in the perineal region. In cases where pharmacological methods cannot be applied in the postpartum period or for mothers who do not want to use them, cold application can be considered as an alternative to reduce pain post-episiotomy.

## CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

## ETHICAL APPROVAL

This is a meta-analysis. The data in the article are from published articles, so no ethical approval was required.

## INFORMED CONSENT

The data in the article are from published articles.

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## REFERENCES

- Abedian, Z., Navabi Tokrighi, S. D., Dadgar, S., & Esmaili, H. (2007). Comparing the effect of cooling gel pads and ice pack, after episiotomy, on the intensity of perineal pain. *The Iranian Journal of Obstetrics, Gynecology and Infertility*, 10(2), 79–86.
- Başgöl, Ş., & Beji, N. K. (2015). Doğum eyleminin ikinci ve üçüncü evresinde sık yapılan uygulamalar ve kanıta dayalı yaklaşım. *Düzce Üniversitesi Sağlık Bilimleri Enstitüsü Dergisi*, 5(3), 66–71.
- Beleza, A. C. S., Ferreira, C. H. J., Driusso, P., dos Santos, C. B., & Nakano, A. M. S. (2017). Effect of cryotherapy on relief of perineal pain after vaginal childbirth with episiotomy: a randomized and controlled clinical trial. *Physiotherapy*, 103(4), 453–458. <https://doi.org/10.1016/j.physio.2016.03.003>
- Bini Solomon, R. J., & Ahitha, V. (2019). Effectiveness of cold application on episiotomy pain among postnatal mothers in selected hospitals at kanyakumari district. *Asian Journal of Nursing Education and Research*, 9(2), 188–192. <https://doi.org/10.5958/2349-2996.2019.00039.9>
- East, C. E., Begg, L., Henshall, N. E., Marchant, P., & Wallace, K. (2007). Local cooling for relieving pain from perineal trauma sustained during childbirth. *Cochrane Database of Syst Rev*, 4(1), 1–5.
- East, C. E., Begg, L., Henshall, N. E., Marchant, P. R., & Wallace, K. (2012). Local cooling for relieving pain from perineal trauma sustained during childbirth. *Cochrane Database of Systematic Reviews*, (5), 1–154. <https://doi.org/10.1002/14651858.CD006304.pub3>
- El-Saidy, T. M. K., Aboushady, R. M. N., & Soliman, H. F. A. (2018). Effect of applying crushed ice gel pads on episiotomy pain and wound healing among postpartum primiparous women. *International Journal of Nursing Didactics*, 8, 7.
- Francisco, A. A., De Oliveira, S. M. J. V., Steen, M., Nobre, M. R. C., & De Souza, E. V. (2018). Ice pack induced perineal analgesia after spontaneous vaginal birth: randomized controlled trial. *Women and Birth*, 1(5), e334–e340. <https://doi.org/10.1016/j.wombi.2017.12.011>
- Gao, D. (1997). *The Encyclopedia of Chinese medicine*. Carlton Books.
- Geetha, P., & Shankar, S. R. (2014). Effectiveness of ice pack application on the level of pain in episiotomy wound. *International Journal of Science and Research (IJSR)*, 4(11), 1607–1611.
- Ghosh, C., Mercier, F., Couaillet, M., & Benhamou, D. (2004). Quality assurance program for the improvement of morbidity during the first three postpartum days following episiotomy and perineal trauma. *Acute Pain*, 6, 1–7. <https://doi.org/10.1016/j.acpain.2004.02.004>
- Hedges, L., & Olkin, I. (1985). *Statistical Methods for Meta-Analysis*. Academic Press.
- Higgins, J., & Green, S. (2011). *Cochrane Handbook for Systematic Reviews of Interventions*. Cochrane Collaboration. <https://training.cochrane.org/handbook>
- Jadad, A. R., Moore, R. A., Carroll, D., Jenkinson, C., Reynolds, D. J. M., Gavaghan, D. J., & McQuay, H. J. (1996). Assessing the quality of reports of randomized clinical trials: Is blinding necessary? *Controlled Clinical Trials*, 17(1), 1–12. [https://doi.org/10.1016/0197-2456\(95\)00134-4](https://doi.org/10.1016/0197-2456(95)00134-4)
- Jahdi, F., Sheikhan, F., & Haghani, H. (2010). The effect of cooling gel pad on the intensity of perineal pain following episiotomy. *Arak Medical University Journal*, 13(3), 76–83.
- JBI Critical Appraisal Checklist for Quasi-Experimental Studies (2019). <https://wiki.joannabriggs.org/pages/viewpage.action?pageId=9273720>
- Jiang, H., Qian, X., Carroli, G., & Garner, P. (2017). Selective versus routine use of episiotomy for vaginal birth. *Cochrane Database of Systematic Reviews*, (2), 1–50. <https://doi.org/10.1002/14651858.CD000081.pub3>
- Kim, H. J., An, J. W., Lee, Y., & Shin, Y. S. (2020). The effects of cryotherapy on perineal pain after childbirth: A systematic review and meta-analysis. *Midwifery*, 89, 102788. <https://doi.org/10.1016/j.midw.2020.102788>
- Leventhal, L. C., de Oliveira, S. M. J. V., Nobre, M. R. C., & da Silva, F. M. B. (2011). Perineal analgesia with an ice pack after spontaneous vaginal birth: A randomized controlled trial. *Journal of Midwifery & Women's Health*, 56(2), 141–146. <https://doi.org/10.1111/j.1542-2011.2010.00018.x>
- Lu, Y. Y., Su, M. L., Gau, M. L., Lin, K. C., & Au, H. K. (2015). The efficacy of cold-gel packing for relieving episiotomy pain—a quasi-randomised control trial. *Contemporary Nurse*, 50(1), 26–35. <https://doi.org/10.1080/10376178.2015.1010257>
- Maha, S., Shehta, M. S., Fahmy, N. M., Ramadan, S. A., & Abd Almeniem, S. O. (2017). Effect of cold-gel packing on episiotomy pain among postnatal mothers. *Egyptian Journal of Health Care*, 8(3), 86–102. <https://doi.org/10.21608/ejhc.2017.44980>
- Mahishale, A., Chougala, A., & Patted, S. (2013). Effect of therapeutic ultrasound and maternal cooling gel pad for perineal pain following vaginal delivery with episiotomy. *Journal of Womens Health Care*, 2(3), 1–4. <https://doi.org/10.4172/2167-0420.1000128>
- Minov, A. (2017). *Epizyotomi bakımında kullanılan lavanta yağı ve buz uygulamasının epizyotomi ağrısına etkisi*. Master Thesis, Ege University, Health Science Faculty.
- Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., & Stewart, L. A. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, 4(1), 1–9. <https://doi.org/10.1186/2046-4053-4-1>
- Navvabi, R. S., Kerman, S. F., Saroneh, R. M., & Abedian, Z. (2011). Cold and reduced episiotomy pain interfere with mood and daily activity. *Shiraz E Medical Journal*, 4(12), 87–92.
- Navvabi, S., Abedian, Z., & Steen-Greaves, M. (2009). Effectiveness of cooling gel pads and ice packs on perineal pain. *British Journal of Midwifery*, 17(11), 724–729.
- Oliveira, S., Silva, F., Riesco, M., Rosario, M., & Nobre, M. (2012). Comparison of application times for ice packs used to relieve perineal pain after normal birth: a randomised clinical trial. *Journal of Clinical Nursing*, 21, 3382–3391.
- Petersen, M. R. (2011). Review of interventions to relieve postpartum pain from perineal trauma. *MCN: American Journal of Maternal Child Nursing*, 36, 241–245. <https://doi.org/10.1097/NMC.0b013e3182182579>
- Pigott, T. (2012). *Advances in meta-analysis*. Springer Science & Business Media.
- Rasha, M. E., Ismail, N., & Ismail, A. A. (2016). Effect of second stage perineal warm compresses on perineal pain and outcome among primiparae. *Journal of Nursing Education and Practice*, 6(4), 48–58. <https://doi.org/10.5430/jnep.v6n4p48>
- Schlaeger, J. M., Gabzdyl, E. M., Bussell, J. L., Takakura, N., Yajima, H., Takayama, M., & Wilkie, D. J. (2017). Acupuncture and acupressure in labor. *Journal of Midwifery & Women's Health*, 62(1), 12–28. <https://doi.org/10.1111/jmwh.12545>
- Senol, D. K., & Aslan, E. (2017). The Effects of Cold Application to the perineum on pain relief after vaginal birth. *Asian Nursing Research*, 11(4), 276–282. <https://doi.org/10.1016/j.anr.2017.11.001>

- Sheikhan, F., Jahdi, F., Khoie, E., Alizadeh, N., Sheikhan, H., & Haghani, H. (2011). Episiotomy discomforts relief using cold gel pads in primiparaus Iranian women (a comparative study). *Research Journal of Medical Sciences*, 5(3), 150–154. <https://doi.org/10.3923/rjmsci.2011.150.154>
- Shin Y. S., Kim H. J., An J. W., Lee Y. Y. (2018). Development of Evidence-based Nursing Practice Guidelines for Cold Application in Adult Care. *Korean Journal of Adult Nursing*, 30, (3), 325. <http://dx.doi.org/10.7475/kjan.2018.30.3.325>
- Şolt, A. K., & Gul, D. K. (2020). The effect of acupressure applied to points LV4 and LI4 on perceived acute postpartum perineal pain after vaginal birth with episiotomy: a randomized controlled study. *Archives of Gynecology and Obstetrics*, 301(2), 473–481. <https://doi.org/10.1007/s00404-020-05439-z>
- Steen, M., & Marchant, P. (2007). Ice packs and cooling gel pads versus no localised treatment for relief of perineal pain: a randomised controlled trial. *Evidence-Based Midwifery*, 5(1), 16–23.
- Vargens Octavio, M. C., Silva, A. C. V., & Progianti, J. M. (2013). Non-invasive nursing technologies for pain relief during childbirth—The Brazilian nurse midwives' view. *Midwifery*, 29(11), e99–e106. <https://doi.org/10.1016/j.midw.2012.11.011>
- Wang, T., Mantini, D., & Gillebert, C. R. (2018). The potential of real-time fMRI neurofeedback for stroke rehabilitation: A systematic review. *Cortex*, 107, 148–165. <https://doi.org/10.1016/j.cortex.2017.09.006>
- Yanık, N. T., & Ertem, G. (2020). Epizyotomi sonrası perineal ağrının tedavisinde kullanılan non farmakolojik yöntemlerin sistematik açıdan incelenmesi. *Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi*, 9(2), 195–208. <https://doi.org/10.37989/gumussagbil.487004>
- Yusamran, C., Titapant, V., & Kongjeera, A. (2007). Relief perineal pain after perineorrhaphy by cold gel pack pad: A randomized controlled trial. *Thai Journal of Nursing Research*, 11(2), 87–95.
- Zhang, H., Lan, X., Penig, B., & Li, B. (2019). Is total laparoscopic pancreaticoduodenectomy superior to open procedure? A meta-analysis. *World Journal of Gastroenterology*, 25(37), 5711–5731. <https://doi.org/10.3748/wjg.v25.i37.5711>

## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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