

Effects of Topical Oils on Neonatal Skin: A Systematic Review

Gözde Aksucu, MSc; Merve Azak, MSc; and Seda Çağlar, PhD

ABSTRACT

OBJECTIVE: To identify studies that aimed to determine the effects of topical oils on neonatal skin.

DATA SOURCES: Authors searched PubMed, Cochrane Central Register of Controlled Trials, and Science Direct databases.

STUDY SELECTION: The databases were searched for studies published through February 2022 (when the search was conducted) using the keywords “skin”, “neonatal”, “infant”, and “oil”. Fourteen randomized controlled trials that met the eligibility criteria were included in the review.

DATA EXTRACTION: Researchers used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) reporting guidelines to guide this systematic review. Two authors reviewed and evaluated the articles independently.

DATA SYNTHESIS: The 14 studies included in this review were conducted with a total of 5,683 neonates, most of whom were preterm. The included studies used blended sunflower (n = 8), coconut (n = 5), almond (n = 2), olive (n = 1), mustard (n = 1), and vegetable (n = 1) oils. These studies investigated the effects of topical oils on the skin’s barrier functions and skin integrity. Most studies used noninvasive measurement devices to evaluate the skin’s barrier functions; they used a variety of scoring systems to evaluate skin integrity. Eleven of the studies concluded that the oils used in the skincare of neonates effectively improve the skin condition and barrier functions of the skin. However, three studies found equivocal, negative, or mixed findings.

CONCLUSION: Although current evidence indicates a potential benefit, more studies with a high level of evidence on the subject are required.

KEYWORDS: neonatal, preterm, skin barrier, skin care, skin integrity, skin, topical oil

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INTRODUCTION

Skincare is essential for preventing infections, especially in preterm neonates, because their skin’s barrier function is immature. Maturation of the stratum corneum, the skin’s protective layer, occurs in the third trimester, so imbalances in stratum corneum hydration (SCH) can occur in preterm neonates.¹

Moisturizers trap water in the stratum corneum and support the skin barrier by providing exogenous lipids that aid epidermal lipid metabolism.² Thus, they help establish SCH balance by providing extra moisture and preventing fluid loss from subcutaneous tissue.^{3,4} Moisturizers form a protective occlusive layer on the skin surface and help retain moisture in the upper layer. Transepidermal water loss (TEWL) can be reduced by 40% with an occlusive moisturizer.⁵ In term infants, moisturizers are recommended for cracked and dry skin to restore skin integrity and develop barrier functions.^{3,4}

The use and effects of moisturizers in neonates, especially in preterm infants, have been popular subjects in recent years.^{6,7} Currently, there are no evidence-based guidelines to standardize skin care for preterm infants.¹ However, topical oils are widely used by parents and nurses in developed and developing countries to support the skin maturation of neonates,^{6,7} in part because these oils are inexpensive and easily available.¹ Evidence-based research on the effect of topical oils is vital for developing a cost-effective skin care program for neonates.^{1,6}

Research indicates that applying sunflower oil, coconut oil, and almond oil has a favorable effect on neonatal skin, improving the skin condition and barrier functions.^{1,7–12} In addition to their effects on the skin, these oils have been reported to preserve heat, increase weight gain, and reduce bacterial colonization and sepsis.^{10–12} However, some studies in which sunflower oil, olive oil, and mustard oil were used did not generate significant or positive results.^{6,13,14} Because the results of the studies conducted on this subject varied, the present authors conducted a systematic review to examine the effects of topical oils on the skin of neonates, evaluate the effectiveness and safety of the oils, and provide evidence-based data in

infant care for nurses. The authors focused on two research questions: 1) Do topical oils used in the skin care of neonates have favorable effects on skin pH, TEWL, and SCH? And 2) which topical oil used in the skin care of neonates has the most favorable effects on skin pH, TEWL, and SCH?

METHODS

Eligibility Criteria

The review protocol was predefined using the PRISMA (Preferred Reporting Items for Systematic Review and Meta-analysis Protocols)¹⁵ checklist according to the PICOS (P, Participants; I, Interventions; C, Comparators; O, Outcomes; S, Study designs) framework (Table 1). Only randomized controlled trials (RCTs) published in peer-reviewed journals were included. This review excluded unpublished thesis studies, studies whose full texts were unavailable, verbal or poster announcements presented in seminars, case presentations, meta-analyses, or review articles. Because of limited translation ability, studies written in a language other than English were excluded.

Data Sources and Search Methods

Before starting the study, three investigators determined the study protocol, keywords, arrangement of keywords, and limitations to evaluate the process and quality of the studies. A pilot study was conducted to perform the processes of searching the PubMed electronic database for the keywords within the scope of the study, selecting articles, retrieving data from two research articles, and evaluating the quality of the articles. The differences arising in terms of opinion and information were resolved through discussion during the pilot study. After this pilot study, the researchers decided to perform the search by combining the keywords “skin AND (neonatal OR infant) AND oil”.

From January 29 to February 3, 2022, the researchers searched PubMed, CENTRAL (Cochrane Central Register of Controlled Trials), and Science Direct electronic databases according to eligibility criteria. The literature search included articles published in English through February 2022 with no lower limit for publication date.

The search was performed with the keywords “skin”, “oil”, “neonatal”, and “infant” using Boolean operators.

Study Selection

The first and second researchers independently performed the literature review, article selection, and data retrieval procedures to reduce the potential risk of bias in the systematic review. Each stage was verified in a session attended by the third researcher, and consensus was reached.

Data Extraction

The researchers prepared a data retrieval form to record the features of each article included in the review. With this form, data were obtained regarding the authors, year of publication, design type, country, sample, intervention type, frequency and duration of intervention, assessment of intervention and follow-up, and the studies’ primary results (Table 2).

Quality Assessment

The quality of studies included in the systematic review was checked with the 13-question quality assessment tool (JBI Critical Appraisal Checklist for Randomized Controlled Trials) prepared by The Joanna Briggs Institute for RCTs.¹⁶ Each item in this tool was evaluated with the options “yes,” “no,” “unclear,” and “NA”. Researchers assigned one point for each “yes” response during the evaluation and zero points for all other responses. The JBI Critical Appraisal possible score ranges from 0 to 13, with higher scores indicating better methodological quality. The first and second researchers performed this assessment independently from each other. It was then verified in a session attended by the third researcher, and a consensus was reached. The assessment results for each study are listed in Table 2 as “quality score.”

Data Analysis

Data were analyzed by narrative synthesis. Narrative synthesis can be used for both quantitative and qualitative studies and is useful when experimental and quasi-experimental studies included in a systematic review are not sufficiently similar for a meta-analysis.¹⁷ In this systematic review, the included articles varied in terms of the topical oils used, application methods, the amount and duration of their use, the skin parameters observed, and data collection methods.

Limitations

A limitation of this systematic review is that it was not registered with PROSPERO before it was conducted.

RESULTS

Researchers first examined the titles and abstracts of accessed articles (n = 671). Duplicates (n = 587) and articles

Table 1. PICOS ELEMENTS FOR THE REVIEW PROTOCOL

Element	Reviewed
Participants	Neonates
Interventions	Topical oils
Comparators	Other topical oils OR moisturizers OR placebo
Outcomes	Skin integrity or pH or TEWL or SCH
Study design	Randomized controlled trials

Abbreviations: PICOS, Participants, Interventions, Comparators, Outcomes, Study designs; SCH, stratum corneum hydration; TEWL, transepidermal water loss.

**Table 2. STUDIES EVALUATING THE EFFECTS OF TOPICAL OILS ON NEONATAL SKIN**

Article	Study Design	Country	Participants	Intervention	Frequency and Duration of Intervention	Assessment of Intervention and Follow-up	Outcomes	Quality Score
Darmstadt et al, ²⁰ 2004	RCT	Egypt	103 Preterm neonates - Intervention group (n = 51) - Control group (n = 52)	- Sunflower oil group - Standard care group	- The intervention group received applications of sunflower oil (each application 4 g/kg) three times daily for the first 14 d and then twice daily until 28 d of life or until discharge from the NICU. - The control group received routine skin care.	- Skin integrity; skin condition score of Lane and Drost - Follow-up at birth and days 3, 7, 14, 21, and 28.	The skin condition score increased faster in the control group than in the sunflower oil group (ie, worse skin condition) and to a higher degree at all time points in the first 28 d of life.	
Darmstadt et al, ²¹ 2007	RCT	Bangladesh	495 Preterm neonates - Intervention group - Intervention group - Control group (Group sizes were not specified)	- Sunflower oil group - Aquaphor group - Untreated control group	- Emollients were applied three times daily (4 g/kg per treatment) for the first 14 d to the entire body surface (except for the scalp, face, and intravascular catheter sites), and then twice daily until discharge. - The control group received standard skincare, which did not include the application of topical emollients.	- Skin integrity; 9-point scale - Follow-up at enrollment and on days 3, 7, 14, 21, and 28, as long as the infant remained in the hospital.	Mean skin score gradually increased in all 9 groups. However, the sunflower and Aquaphor groups had lower skin scores (ie, better skin condition) at the baseline and at most follow-up examinations, compared with the control group. The intervention groups also showed smaller incremental increases in skin scores between the baseline and the 3-d follow-up.	9
Vaivre-Douret et al, ¹⁹ 2008	RCT	France	49 Preterm neonates - Intervention group (n = 12) - Intervention group (n = 12) - Placebo group (n = 12) - Control group (n = 13)	- Sweet almond oil - ISIO4 vegetable oil blend - Placebo: normal saline - Control group	- Sensori-Tonico-Motor touch was performed on the three treatment groups for 15 min, twice per d for 10 consecutive days. The quantity of oil or normal saline solution used for each infant was 5 mL.	- Skin integrity; clinical evaluation of the cutaneous status - SCH; noninvasive measurement device	SCH was significantly better in the intervention groups compared with the controls. Skin conditions (eg, eczema) were frequent in the preterm neonates (30%, 14/49). The number of clinical dermatologic pathologies decreased significantly in the ISIO4 group ($P = .004$) but not in the sweet almond oil group ($P = .097$) and was increased in the placebo group ($P = .010$) compared with the controls. No adverse dermatologic events were observed.	10
Darmstadt et al, ⁶ 2014	RCT	Bangladesh	491 Preterm neonates - Intervention group - Intervention group - Control group (Group sizes were not specified)	- Sunflower oil group - Aquaphor group - Standard care group	- The intervention groups received 4 g/kg of emollient three times daily for 14 d, then two times daily every day after that, avoiding the scalp, face, and intravascular catheter sites. - The control group received no emollient applications or massage.	- Skin integrity; form developed by the investigators - Skin integrity was assessed the first day, on hospital day 3, and on postnatal days 7, 14, 21, and 28, as long as the infant remained in the hospital.	Skin integrity was significantly better in the 9 experimental groups than in the control group. Moisturizers were reported to prevent infection only in the absence of skin damage. The incidence of infection in the Aquaphor group was lower than that in the sunflower oil group, but the difference was not significant.	9

(continues)

Table 2. STUDIES EVALUATING THE EFFECTS OF TOPICAL OILS ON NEONATAL SKIN, CONTINUED

Article	Study Design	Country	Participants	Intervention	Frequency and Duration of Intervention	Assessment of Intervention and Follow-up	Outcomes	Quality Score
Kanti et al, ⁶ 2014	RCT	Germany	22 Preterm neonates - Intervention group (n = 11) - Control group (n = 11)	- Sunflower oil group - No oil group	- Sunflower oil was applied every 3-4 h during the first 10 d of life on the whole body surface. - The control group received no intervention.	- NSSCS - Barrier functions of the skin; noninvasive measurement devices - Assessed at inclusion (<48 h after birth) and on postnatal days 5, 11, and 21.	The sebum level remained constant in both groups but the skin pH decreased. TEWL remained constant in the control group but significantly increased in the intervention group until day 11. SCH remained constant in the control group; there was a continuous decrease in the experimental group until day 21. This decrease continued after the sunflower oil application was stopped. It was considered that sunflower oil application might delay the maturation of the skin's barrier functions in preterm neonates.	8
Nangia et al, ¹¹ 2015	RCT	India	74 Very-low-birth-weight neonates - Intervention group (n = 37) - Control group (n = 37)	- Coconut oil group - Standard skin care group	Beginning at 12 ± 6 h of age, neonates in the intervention group received coconut oil application on the skin of the trunk below the neck twice a day for the first week of life (each application 4 mL). - The control group received no oil application.	- Skin integrity; Skin condition score of Lane and Drost - TEWL; noninvasive measurement device - In the intervention group, TEWL was measured immediately before each session of oil application. In the control group, TEWL was measured every 12 h for the first week of postnatal life at the same time as the hour of birth. Skin integrity was graded at the end of 1 wk of life.	Coconut oil application resulted in a reduction in TEWL without increasing colonization on the skin. It was reported that the skin integrity improved.	8
Salam et al, ¹² 2015	RCT	Pakistan	258 Preterm neonates - Intervention group (n = 128) - Control group (n = 130)	- Coconut oil group - Standard skin care group	- Coconut oil (approximately 5 mL/kg) was applied twice a day over the newborn's body surface for 2-3 min until the 28th day after birth. - The control group received routine skin care.	- Skin integrity; four classification criteria - Skin conditions were assessed each day after the sponge bath in both groups.	The skin integrity of the experimental group 9 was reported to be better than that of the control group, and no adverse effects (eg, local irritation, infection) were observed.	9

(continues)

Table 2. STUDIES EVALUATING THE EFFECTS OF TOPICAL OILS ON NEONATAL SKIN

Article	Study Design	Country	Participants	Intervention	Frequency and Duration of Intervention	Assessment of Intervention and Follow-up	Outcomes	Quality Score
Cooke et al, ¹³ 2016	RCT	England	115 Term neonates - Intervention group (n = 38) - Intervention group (n = 38) - Control group (n = 39)	- Olive oil group - Sunflower oil group - No oil group	Parents applied four drops of oil to their baby's left forearm, left thigh, and abdomen twice a day.	- Skin integrity; NSCS - Barrier functions of the skin; noninvasive measurement devices - The first assessment was conducted prior to discharge from the hospital. A second assessment was made at 4 wk ± 5 d.	Although both oil groups achieved a significant improvement in SCH, less improvement was observed in the lipid lamellar structure in these groups compared with the control group. There were no significant between-group differences in TEWL, pH, or skin scores. It was emphasized that the study was not clinically significant, and caution should be exercised when recommending an oil for neonatal skin until further studies are conducted.	10
Kanti et al, ⁹ 2017	RCT	Germany	46 Term neonates - Intervention group (n = 22) - Intervention group (n = 24)	- Baby lotion group - Sunflower oil group	Baby lotion and sunflower oil were applied three times/wk on the whole body for 5 wk.	- Skin integrity; NSCS - Barrier functions of the skin; noninvasive measurement devices - Researcher obtained the NSCS and measured barrier function before the first application and after 5 wk.	SCH increased while skin pH decreased in 9 both groups. TEWL decreased in the forearm in both groups, in the thighs in the baby lotion group, and in the abdomen in the sunflower oil group.	9
Strunk et al, ⁷ 2018	RCT	Australia	72 Preterm neonates - Intervention group (n = 36) - Control group (n = 36)	- Coconut oil group - Standard skin care group	- Coconut oil (5 mL/kg) was applied within 24 h of birth and repeated every 12 h for 21 d. - The control group received routine neonatal care without topical coconut oil application.	- Skin integrity; NSCS - T researcher obtained the NSCS before the first application and then on days 7, 14, and 21.	The coconut oil group had better skin integrity and no adverse effects.	9
Summers et al, ¹⁴ 2019	RCT	Nepal	995 Neonates - Intervention group (n = 500) - Intervention group (n = 495)	- Mustard oil group - Sunflower oil group	At the end of pregnancy, mothers were given 100 mL of oil and instructions for administration. The mothers massaged the baby with oil. During the first week, home visits were made every day for oil supply and days 1, 10, and 21.	- Skin integrity; NSCS - Barrier functions of the skin; noninvasive measurement devices - Follow-up on days 1, 3, 7, 14, and 28.	Skin pH decreased more rapidly in the first 9 week of life in the sunflower oil group. Skin integrity scores in both groups worsened on days 1-14 and improved on days 15-28; there was no significant difference between the two groups. TEWL increased in both groups, with no significant difference between them. Sunflower oil was considered more protective in neonates raised in environments with limited facilities because the acid mantle on the skin developed faster in the group in which sunflower oil was used.	9

(continues)

Table 2. STUDIES EVALUATING THE EFFECTS OF TOPICAL OILS ON NEONATAL SKIN, CONTINUED

Article	Study Design	Country	Participants	Intervention	Frequency and Duration of Intervention	Assessment of Intervention and Follow-up	Outcomes	Quality Score
Caglar et al, ¹ 2020	RCT	Turkey	90 Preterm neonates - Intervention group (n = 30) - Intervention group (n = 30) - Control group (n = 30)	- Sunflower oil group - Almond oil group - Standard skin care group	The researcher applied the appropriate oil (4 mL/kg) to the whole body of each infant in the intervention groups four times a day for 5 d.	- Skin integrity; NSCS - SCH; noninvasive measurement device - Before the first application and after 5 d and 6 h after the last oil application, the researcher obtained the NSCS and measured the SCH.	The mean SCH and NSCS in the experimental groups were at better levels than those of the control group; there was no difference between the two intervention groups. The researchers concluded that neither sunflower nor almond oil has adverse effects, the use of these oils improves SCH, and they can be used by nurses to moisturize neonatal skin.	10
Konar et al, ¹⁰ 2020	RCT	India	2,294 Preterm neonates - Intervention group (n = 1,146) - Control group (n = 1,148)	- Coconut oil group - No oil group	- The intervention group received massage with coconut oil (5 mL) four times daily. - The control group received massage without oil.	- Skin integrity; NSCS - Follow-up on days 7, 14, 21, and 28.	Skin integrity was better, and the skin matured earlier in the coconut oil group. The authors concluded that coconut oil contributed to the maturation of the skin.	9
Khatun et al, ¹⁸ 2022	RCT	India	585 Neonates - Intervention group (n = 291) - Control group (n = 294)	- Coconut oil group - No oil group	- The intervention group received massage with coconut oil (5 mL) four times daily in the first 30 d of life. - The control group received massage without any emollient	- Skin integrity; NSCS - Researchers obtained NSCS at the time of entry in the study, and on the 14th and 28th day of life.	There was no significant difference in mean NSCS between the groups at the time of entry in the study. NSCS was significantly lower (ie, better skin condition) in the coconut oil group on days 14 and 28.	10

Abbreviations: NICU, neonatal ICU; NSCS, Neonatal Skin Condition Score; RCT, randomized controlled trial; SCH, stratum corneum hydration; TEWL, transepidermal water loss.

not related to the review questions (n = 64) were removed, and the full text of the remaining articles (n = 20) was evaluated. In total, 14 articles met the inclusion criteria and were included in this review (Figure).

When the quality assessment of these studies was performed, four of the studies^{1,13,18,19} received 10 points, eight of them^{7-10,12,14,20,21} received 9 points, and two of them^{6,11} received 8 points. The mean score was 9 points.

Ten of the studies included in the review^{6-12,18,20,21} evaluated the effect of a single topical oil on skin condition and skin barrier functions in neonates, and four of the studies^{1,13,14,19} evaluated two different topical oils. The topical oils evaluated were sunflower oil (n = 8), coconut oil (n = 5), almond oil (n = 2), olive oil (n = 1), mustard oil (n = 1), and ISIO4 vegetable oil blend (consisting of 52% sunflower, 25% high-oleic sunflower, 20% rapeseed, and 3% grapeseed oils; n = 1). Control groups were given routine care or left without any intervention (n = 12). One study compared two oil groups (mustard oil and sunflower oil).¹⁴ In another study, comparisons were drawn between a topical oil intervention group and a group to whom baby lotion was applied rather than to a control group (Table 2).⁹

Skin integrity was evaluated in all studies using various tools. Moreover, some of the studies (n = 7)^{1,6,9,11,13,14,19} evaluated variables such as TEWL, SCH, skin pH, sebum level, and structure of lipid lamellae as separately mea-

sured barrier functions of the skin. The skin's barrier functions (TEWL, SCH, or pH) were evaluated using various noninvasive measurement devices (n = 7). The Neonatal Skin Condition Score (NSCS; n = 8) was most frequently used to assess skin integrity. The NSCS was developed as a tool for nurses to evaluate infant skin conditions daily. The scale assesses skin dryness, erythema, and eruption. The best and worst possible scores are 3 and 9, respectively, with low scores indicating normal skin condition and high scores indicating poor skin condition. Darmstadt et al⁸ and Salam et al¹² used a form that they prepared themselves; and Nangia et al,¹¹ Darmstadt et al,²⁰ and Darmstadt et al²¹ used the Skin Condition Score of Lane and Drost.²² Table 2 shows the study design, participants, intervention, and assessment of intervention of the studies.

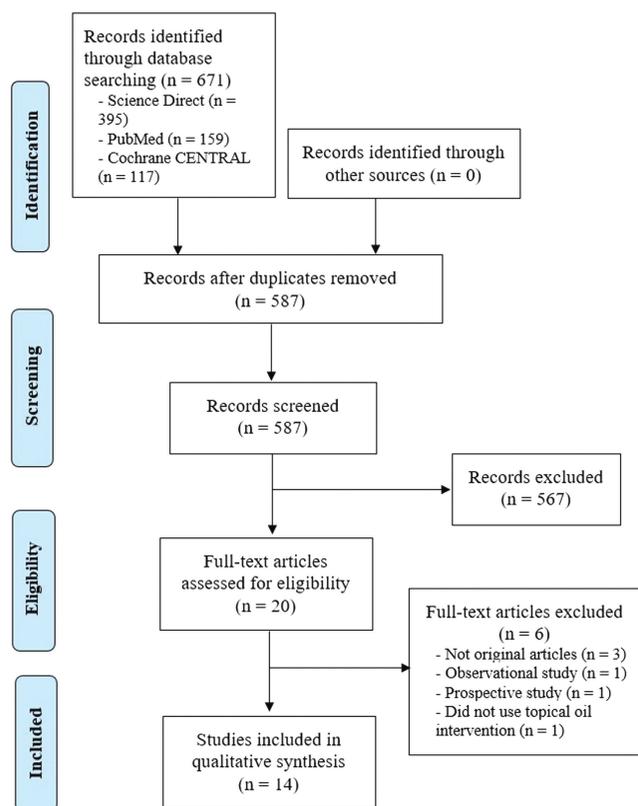
The studies were conducted with a total of 5,683 neonates: 4,520 preterm, 1,089 term, and 74 very low birth weight infants. Eleven of the 14 studies^{1,7-12,18-21} concluded that the oils used in the skin care of neonates effectively improve skin condition and barrier functions. However, three studies^{6,13,14} found equivocal, negative, or mixed findings.

Studies Using Sunflower Oil

Positive results. Five of the eight studies using topical sunflower oil reported positive results on skin condition and barrier function and recommended its use.^{1,8,9,20,21} Çağlar et al¹ reported that SCH and skin condition scores were better when using sunflower oil than in the control group that received standard skin care, and no adverse effects were observed. In another study in which the control group received standard skin care, researchers found that skin condition was significantly better in the sunflower oil group.⁸ However, sunflower oil used as a moisturizer only prevented infection when there was no skin damage.⁸ Kanti et al⁹ compared sunflower oil and baby lotion and found that although SCH increased in both groups, pH decreased, and TEWL decreased in various parts of the body. In two studies, skin condition scores gradually increased in all groups, but the sunflower groups had lower skin scores (ie, better skin condition) or increased more slowly than the control group.^{20,21}

Mixed or null results. In one of the studies, both positive and negative results were obtained;¹⁴ in another study, no clinically significant results were found.¹³ Summers et al¹⁴ compared sunflower oil and mustard oil, and reported that pH decreased rapidly in the first week of life in the sunflower oil group, creating a protective acidic mantle on the skin. However, in the same study, TEWL increased, and skin condition scores worsened on days 1 to 14, followed by improvement on days 15 to 28. Cooke et al¹³ compared sunflower oil and olive oil in their study. They found that although sunflower oil

Figure. FLOW DIAGRAM



provided a significant improvement in SCH, it provided less improvement in lipid lamella structure than the control group. The authors also reported that there were no significant between-group differences in terms of TEWL, pH, or skin condition scores. As a result, they advise caution when recommending an oil for neonatal skin until further studies are conducted.

Negative results. Kanti et al⁶ found negative results when comparing sunflower oil use with a control group. In the sunflower oil group, pH decreased, TEWL increased significantly until day 11, and SCH decreased continuously. They stated that SCH continued to decrease after the oil application was completed. In the light of these findings, they conclude that sunflower oil might delay the development of skin barrier functions in preterm neonates.

Studies Using Coconut Oil

All five studies using coconut oil in neonatal skin care reported a positive effect on skin condition and/or skin barrier functions.^{7,10-12,18} Konar et al¹⁰ concluded that the coconut oil group had better skin integrity and earlier skin maturation in comparison with the no-oil group. Similarly, Nangia et al¹¹ reported that coconut oil decreased TEWL and improved skin integrity in very low birth weight neonates without increasing colonization. Salam et al¹² and Strunk et al⁷ both conducted studies with preterm neonates. They concluded that skin integrity was better in the coconut oil group; no adverse effects were observed. Khatun et al¹⁸ found better skin condition scores in the coconut oil group than in the control group.

Studies Using Other Oils

Almond oil, olive oil, and mustard oil were used as comparison groups in three studies using sunflower oil,^{1,13,14} and one study compared sweet almond oil and an ISIO4 vegetable oil blend.¹⁹ Çağlar et al¹ found that almond oil use was associated with better SCH and skin condition scores in comparison with standard skin care, and no adverse effects were observed. In addition, the authors found no significant difference between the groups using sunflower oil and almond oil; they recommend the use of almond oil in neonatal skin care. Vaivre-Douret et al¹⁹ compared sweet almond oil and ISIO4 vegetable oil blend groups with placebo and control groups. The reported that SCH was significantly better in the intervention groups than the control groups, and no adverse dermatologic events were observed.

Cooke et al¹³ investigated olive oil use, and reported no between-group differences in TEWL, pH, and skin condition scores, but SCH was improved in the olive oil group compared with the no-oil group. They emphasized that the results overall were not clinically significant and, therefore, caution should be taken when recommending an oil for neonatal skin until further studies are conducted.

Summers et al¹⁴ investigated mustard oil and sunflower oil use in their study. With mustard oil, TEWL increased and skin integrity scores worsened on days 1 to 14 but improved on days 15 to 28. With the sunflower oil group, pH decreased faster than it did in the mustard oil group. The authors conclude that massage with sunflower oil might be better for neonates born in underprivileged environments.

DISCUSSION

According to the literature, some frequently used oils, particularly mustard oil and olive oil, may be harmful to newborn skin.^{23,24} No favorable effects have been reported for olive oil in studies conducted with both neonatal and non-neonatal populations. Danby et al²⁵ conducted a study with adults to make inferences regarding sunflower and olive oil use on neonatal skin. The authors found that sunflower oil had a favorable impact on the skin; however, the use of olive oil on the same participants damaged the skin barrier. Thus, olive oil use was not recommended for neonatal skin.²⁵ In Nepal and certain parts of Northeast India, mustard oil massage is a traditional practice for neonates; however, the literature indicates it has the potential to harm neonatal skin.^{23,26,27} Summers et al²⁸ reported that premature neonates who received mustard oil massage more frequently experienced skin irritation and impaired skin barrier function in comparison with neonates who did not receive mustard oil massage.

In this systematic review, results on sunflower oil varied. In a study examining the effect of sunflower oil on newborn skin condition scores, Karakoç²⁹ concluded that the skin condition scores in the sunflower oil group were significantly better than those of the control group. Similarly, another study³⁰ found that patients treated with sunflower oil showed statistically less dermatitis than did patients treated with Johnson baby oil. Both intervention groups had a better outcome than those in the control group after 14 days.³⁰ Some studies found that sunflower oil improves the barrier functions of the skin and skin condition and does not have adverse effects.^{1,9,12} In two other studies, sunflower oil groups had better skin condition scores than did the control groups.^{20,21} However, the study by Kanti et al⁶ found that sunflower oil application could delay maturation of the skin's barrier functions in preterm neonates. In another study comparing sunflower and mustard oils, TEWL increased in both groups.¹⁴ Cooke et al¹³ concluded that olive oil and sunflower oil improved SCH; however, there was no significant difference from the control group in terms of TEWL, pH, and skin condition, and the study was not clinically significant.

If coconut oil is used for the skin, virgin coconut oil (processed within 24 hours of harvest to avoid the formation of fatty acids that may cause skin irritation) should be used.³¹ In a systematic review examining the effects of coconut oil on preterm neonates' skin care, TEWL

and infection rates decreased, growth and skin integrity improved, and no significant adverse effects associated with coconut oil application were observed.³² In addition, in a study investigating neonatal nurses' perceptions of topical coconut oil for very preterm infants, the vast majority of nurses (92%) felt that the application of coconut oil improved the preterm infant's skin condition.³³ In the studies investigating coconut oil use, the researchers concluded that it improved skin condition,^{10–12,34} reduced TEWL,¹¹ and contributed to skin maturation.¹⁰ Moreover, no adverse effects were observed.

Additional studies with higher levels of evidence are required before making definitive recommendations on the use of sunflower oil and coconut oil. However, it may be appropriate to warn users about the potential adverse effects of olive oil and mustard oil, although no definitive statements can be made without further research.

CONCLUSIONS

Eleven of the studies included in this review concluded that the oils used in the skin care of neonates effectively improve the skin condition and barrier functions of the skin, whereas three studies found negative or equivocal results in neonatal skin. Although current evidence indicates a potential benefit, because of the limited number of studies on the subject, healthcare providers should evaluate oil use in terms of potential risks and benefits and consider adverse effects. Existing study findings are not sufficient to warrant policy changes in clinics; more studies with higher levels of evidence are required. The authors hope that this review encourages additional research on this topic by making the gap in the subject matter visible. ●

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