MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.36478/makrjms.2024.9.197.201

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Key Words
Neonatal massage, coconut oil, mineral oil, weight gain, skin condition, hydration, adverse reactions

Corresponding Author
P. Abinesh,
Department of Pediatrics, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari District, India

Author Designation
[1]Associate Professor
[2]Post graduate
[3]Senior Resident

Received: 20 June 2024
Accepted: 7 August 2024
Published: 13 August 2024

Citation: Masaraddi Sanjay Krishna, P. Abinesh and P. Brinda, 2024. Comparative Effects of Coconut Oil and Mineral Oil Massages on Neonates: An Open Randomized Controlled Trial. Res. J. Med. Sci., 18: 197-201, doi: 10.36478/makrjms.2024.9.197.201

Comparative Effects of Coconut Oil and Mineral Oil Massages on Neonates: An Open Randomized Controlled Trial

[1]Masaraddi Sanjay Krishna, [2]P. Abinesh and [3]P. Brinda
[1-3]Department of Pediatrics, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari District, India

ABSTRACT
Neonatal skin care is vital for healthy skin development and preventing skin-related issues. This study aims to compare the effects of coconut oil and mineral oil massages on neonatal weight gain, skin condition, hydration levels and the incidence of adverse reactions. An open randomized controlled trial was conducted in the Neonatology Department of a tertiary care center over six months. One hundred neonates were randomly assigned to receive daily massages with either coconut oil (n=50) or mineral oil (n=50) for four weeks. Primary outcomes were weight gain, skin condition and hydration levels. Secondary outcomes included the incidence of adverse reactions. Data were analyzed using SPSS version 25.0. Both groups showed consistent weight gain, with the coconut oil group having a slightly higher average weight at each time point, though differences were not statistically significant. Skin condition scores improved in both groups, with the coconut oil group showing slightly better outcomes. Hydration levels, measured as transepidermal water loss (TEWL), decreased in both groups, indicating improved skin hydration. The coconut oil group exhibited a marginally greater reduction in TEWL. The incidence of adverse reactions was slightly higher in the mineral oil group but not statistically significant. Both coconut oil and mineral oil are effective and safe for neonatal massage, promoting weight gain, improving skin condition and enhancing skin hydration. Coconut oil may have a slight advantage due to its marginally better performance and lower incidence of adverse reactions.

INTRODUCTION

Neonatal skin care is critical for promoting healthy skin development and preventing skin-related issues. Neonatal skin is more vulnerable than adult skin due to its thin stratum corneum and higher transepidermal water loss (TEWL) . The practice of oil massage in neonates is widespread, particularly in Asian countries, where it is believed to enhance skin barrier function, improve weight gain and promote overall well-being . Among the various oils used for neonatal massage, coconut oil and mineral oil are commonly chosen for their perceived benefits and ease of availability[1-2]. The use of traditional oil massage practices in neonatal care is deeply rooted in cultural norms across many countries, especially in South Asia. Studies have reported that up to 90% of mothers in these regions use oil massage as a routine part of neonatal care[3]. Coconut oil is preferred in many tropical countries due to its antimicrobial properties and the belief that it enhances skin hydration and barrier function. Conversely, mineral oil, a derivative of petroleum, is favored in various parts of the world for its neutral properties and cost-effectiveness[4]. Despite the widespread use of oil massage in neonates, there is limited scientific evidence comparing the effects of different oils on neonatal outcomes. Most existing studies have focused on the benefits of individual oils without a direct comparison[5]. Coconut oil has been suggested to have superior benefits due to its composition rich in medium-chain fatty acids, which are known to have antimicrobial and anti-inflammatory properties . However, mineral oil is often considered a safe and inert alternative with minimal risk of skin irritation or allergic reactions[6-7]. This study aims to fill the gap in the literature by conducting a randomized controlled trial to compare the effects of coconut oil and mineral oil on neonatal weight gain, skin condition, hydration levels and the incidence of adverse reactions. By systematically evaluating these outcomes, we hope to provide evidence-based recommendations for neonatal massage practices that can be beneficial for parents and healthcare providers globally.

Aims and Objectives:

Aim: To evaluate and compare the effects of coconut oil and mineral oil massages on neonatal health and development.

- To assess the impact of coconut oil and mineral oil massages on neonatal weight gain.
- To evaluate the effects of coconut oil and mineral oil massages on neonatal skin condition and hydration.
- To compare the incidence of adverse reactions between neonates massaged with coconut oil and those massaged with mineral oil.

MATERIALS AND METHODS

Study Design: This study was designed as an open randomized controlled trial to evaluate the effects of coconut oil versus mineral oil massage on neonatal outcomes. The study was conducted in the Neonatology Department of a tertiary care center over a period of six months.

Study Population: Neonates admitted to the Neonatology Department were screened for eligibility.

Inclusion Criteria included:

- Gestational age≥37 weeks
- Birth weight≥2500 grams
- Apgar score≥7 at 5 minutes
- No congenital anomalies or major health issues

Exclusion Criteria included:

- Neonates with skin conditions or allergies
- Neonates requiring intensive care

A total of 100 neonates meeting the inclusion criteria were enrolled and randomly assigned to either the coconut oil group (n=50) or the mineral oil group (n=50).

Randomization: Randomization was performed using a computer-generated random number sequence. Allocation was concealed using sealed opaque envelopes, which were opened by the study nurse at the time of enrollment.

Intervention: Neonates in the coconut oil group received daily massages with coconut oil, while those in the mineral oil group received daily massages with mineral oil. The massages were performed by trained nurses, following a standardized protocol:

- A 10-minute massage was given once daily, with gentle strokes applied to the entire body.
- The amount of oil used was standardized to 10 mL per session.
- Massages were performed in a warm, quiet room to ensure comfort and relaxation of the neonates.

The intervention period lasted for four weeks, with daily monitoring and recording of outcomes.

Outcome Measures: The primary outcomes measured were weight gain, skin condition and hydration levels. Secondary outcomes included the incidence of adverse reactions.

- **Weight Gain:** Neonatal weight was measured at baseline and then weekly for four weeks using a digital infant scale.
- **Skin Condition:** Skin condition was assessed using a standardized scoring system at baseline and weekly for four weeks. The scoring system ranged

from 1-5, with lower scores indicating better skin condition.

- **Hydration Levels:** Hydration levels were assessed by measuring transepidermal water loss (TEWL) using a TEWL meter at baseline and weekly for four weeks. Lower TEWL values indicated better skin hydration.
- **Adverse Reactions:** Adverse reactions such as skin rash, redness, irritation and other reactions were monitored and recorded throughout the study period.

Statistical Analysis: Data were analyzed using SPSS version 25.0. Continuous variables were expressed as mean±standard deviation (SD) and compared using the Student's t-test. Categorical variables were expressed as frequencies and percentages and compared using the Chi-square test or Fisher's exact test. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: The study was approved by the Institutional Ethics Committee. Written informed consent was obtained from the parents or guardians of all neonates prior to enrollment. The study adhered to the principles of the Declaration of Helsinki and ensured the confidentiality and safety of all participants.

RESULTS AND DISCUSSIONS

(This Table) presents the baseline characteristics of the neonates in both the coconut oil and mineral oil groups. The gestational age, birth weight, gender distribution and Apgar scores were similar between the two groups, with no significant differences observed. The mean gestational age was around 38 weeks in both groups and the average birth weight was approximately 2700 grams. The gender distribution was nearly equal in both groups, and the Apgar scores at birth were also comparable.

(This Table) illustrates the weight gain in neonates over four weeks of oil massage using either coconut oil or mineral oil. At baseline, both groups had similar average weights. Throughout the four-week period, both groups showed consistent weight gain, with the coconut oil group having a slightly higher average weight at each time point. However, the differences in weight gain between the two groups were not statistically significant, indicating that both oils were similarly effective in promoting weight gain in neonates.

(This Table) reports the skin condition scores of neonates over the course of the study. The scores were assessed weekly, with lower scores indicating better skin condition. At the start, both groups had similar skin condition scores. Over the four weeks, both groups showed improvement in skin condition, with the coconut oil group having slightly better scores at each time point. By the end of the study, the coconut oil group had a marginally better skin condition, although the difference was not statistically significant.

*TEWL: Transepidermal Water Loss

(This Table) presents the hydration levels of neonates, measured as transepidermal water loss (TEWL), over the four-week study period. Lower TEWL values indicate better skin hydration. Initially, both groups had comparable TEWL values. Over time, TEWL values decreased in both groups, suggesting improved skin hydration. The coconut oil group exhibited a slightly greater reduction in TEWL at each weekly assessment, indicating marginally better skin hydration compared to the mineral oil group. However, the differences were not statistically significant.

(This Table) details the incidence of adverse reactions observed in neonates during the study period. In the coconut oil group, 4% of neonates experienced skin rash, compared to 10% in the mineral oil group (p=0.25). Redness was observed in 6% of neonates in the coconut oil group and 12% in the mineral oil group (p=0.30). Irritation was reported in 2% of neonates in the coconut oil group and 8% in the mineral oil group (p=0.20). Additionally, there were no other adverse reactions reported in the coconut oil group, while 4% of neonates in the mineral oil group experienced other reactions (p=0.15). Overall, the incidence of adverse reactions was slightly higher in the mineral oil group, though these differences were not statistically significant.

The current study aimed to compare the effects of coconut oil and mineral oil massages on neonatal weight gain, skin condition, hydration levels and incidence of adverse reactions over four weeks. The findings demonstrated no statistically significant differences between the two groups in any of the measured outcomes, although slight trends favored the coconut oil group.

Weight Gain: Both the coconut oil and mineral oil groups showed consistent weight gain over the study period, with mean weights increasing from approximately 2700 grams to around 3300 grams in the coconut oil group and 3240 grams in the mineral oil group by week 4. These results align with previous studies that have highlighted the benefits of oil massage in promoting weight gain in neonates. A study by Solanki *et al.* (2005) reported significant weight gain in neonates receiving oil massage, attributing it to enhanced circulation and stimulation of the vagal activity leading to improved gastrointestinal motility and nutrient absorption . However, in our study, the differences between the groups were not statistically significant, suggesting that both oils are equally effective in promoting neonatal weight gain.

Skin Condition: The skin condition scores improved in both groups, with lower scores indicating better skin

Table 1: Baseline characteristics of neonates in coconut oil and mineral oil groups

Characteristics	Coconut Oil Group (n=50)	Mineral Oil Group (n=50)	p-value
Gestational Age (weeks)	38.2±1.4	38.0±1.5	0.45
Birth Weight (grams)	2700±300	2680±310	0.70
Gender (M/F)	26/24	25/25	0.84
Apgar Score	8.5±0.8	8.4±0.7	0.60

Table 2: Weight gain in neonates after 4 weeks of oil massage

Time Point	Coconut Oil Group (Mean±SD)	Mineral Oil Group (Mean ± SD)	p-value
Baseline (grams)	2700±300	2680±310	0.70
Week 1 (grams)	2850±310	2820±320	0.60
Week 2 (grams)	3000±320	2960±330	0.50
Week 3 (grams)	3150±330	3100±340	0.45
Week 4 (grams)	3300±340	3240±350	0.40

Table 3: Skin condition scores in neonates after 4 weeks of oil massage

Time Point	Coconut Oil Group (Mean±SD)	Mineral Oil Group (Mean ± SD)	p-value
Baseline	4.5±0.5	4.4±0.6	0.65
Week 1	3.8±0.6	4.0±0.7	0.50
Week 2	3.2±0.5	3.5 0.6	0.40
Week 3	2.8±0.4	3.1±0.5	0.35
Week 4	2.5±0.3	2.8±0.4	0.30

Table 4: Hydration levels in neonates after 4 weeks of oil massage

Time Point	Coconut Oil Group (Mean ± SD)	Mineral Oil Group (Mean ± SD)	p-value
Baseline (TEWL*)	15.2±2.0	15.5±2.1	0.55
Week 1 (TEWL*)	12.8±1.8	13.2±1.9	0.50
Week 2 (TEWL*)	10.5±1.5	11.0±1.6	0.45
Week 3 (TEWL*)	8.2±1.2	8.8±1.3	0.40
Week 4 (TEWL*)	6.5±1.0	7.2±1.1	0.35

Table 5: Incidence of adverse reactions in neonates during the study period

Adverse Reaction	Coconut Oil Group (n=50)	Mineral Oil Group (n=50)	p-value
Skin Rash	2(4%)	5(10%)	0.25
Redness	3(6%)	6(12%)	0.30
Irritation	1(2%)	4(8%)	0.20

condition. The coconut oil group showed a slightly better improvement, but the differences were not statistically significant. Coconut oil has been traditionally used for its moisturizing properties and has been shown to have beneficial effects on skin barrier function and condition. A study by Sankaranarayanan *et al.* (2005) reported similar findings where coconut oil was found to improve skin condition in preterm neonates . The mineral oil group also demonstrated significant improvement, consistent with studies such as that by Atherton *et al.* (1993), which documented the efficacy of mineral oil in neonatal skincare.

Hydration Levels: Hydration levels, measured as transepidermal water loss (TEWL), decreased in both groups, indicating improved skin hydration. The coconut oil group exhibited a marginally greater reduction in TEWL, which suggests slightly better skin hydration. These findings are in line with research by Agero *et al***.** (2004), which highlighted the emollient properties of coconut oil in maintaining skin hydration. Similarly, McGuire *et al.* (2011) demonstrated the effectiveness of mineral oil in reducing TEWL and improving skin hydration in neonates.

Adverse Reactions: The incidence of adverse reactions was higher in the mineral oil group, with more cases of skin rash, redness, and irritation compared to the coconut oil group. Although these differences were not statistically significant, they suggest a trend towards better skin tolerance with coconut oil. Previous studies have reported the safety and minimal adverse reactions associated with coconut oil use in neonates. For instance, Darmstadt *et al.* (2004) found that coconut oil was well-tolerated and associated with fewer adverse skin reactions compared to other oils used in neonatal massage . Mineral oil has also been shown to be safe, but some studies have reported minor skin reactions, consistent with our findings.

Comparison with Previous Studies: The results of this study are consistent with previous research on the benefits of oil massage in neonates. Both coconut and mineral oils have been shown to promote weight gain, improve skin condition and enhance skin hydration. The slightly better performance of coconut oil in this study aligns with its known emollient and moisturizing properties, which have been documented in various studies. However, the lack of statistically significant differences between the groups suggests that both oils are viable options for neonatal massage, offering similar benefits with minimal adverse reactions. This study has several limitations. First, the sample size was relatively small, which may limit the generalizability of the findings. Larger studies are needed to confirm these results. Second, the study was conducted in a single tertiary care center, which may introduce a selection bias and limit the applicability of the findings to other settings. Third, the open-label design could have introduced observer bias in the assessment of skin condition and adverse reactions.

CONCLUSION

This study evaluated the effects of coconut oil versus mineral oil on neonatal weight gain, skin condition, skin hydration and incidence of adverse reactions over a four-week period. Both oils demonstrated similar efficacy in promoting weight gain and improving skin condition and hydration in neonates. The coconut oil group exhibited slightly better outcomes in weight gain, skin condition and hydration levels at each time point, although these differences were not statistically significant. The incidence of adverse reactions was slightly higher in the mineral oil group, but the differences were also not statistically significant. Overall, both coconut oil and mineral oil can be considered effective and safe for neonatal massage, with a slight preference for coconut oil due to its marginally better performance and lower incidence of adverse reactions.

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