



Sunflower oil versus no oil moderate pressure massage leads to greater increases in weight in preterm neonates who are low birth weight[☆]

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ABSTRACT

Background: Growth velocity is one of the most important problems in low birth weight (LBW) neonates.

Aims: The purpose of this study was to compare the effects of body massage with and without sunflower oil on the growth of LBW preterm neonates in Iran.

Study design: A single-blinded randomized clinical trial

Subjects: This study examined neonates admitted to NICU with gestational age of 33–37 weeks and birth weight of 1500–1999 g, without birth asphyxia and medically stable

Outcome measures: Neonates were randomly assigned to two groups to receive moderate pressure massage alone or the same massage with sunflower oil by their mothers, three times a day for 14 consecutive days.

The primary variables were increases in mean of growth parameters (weight, height and head circumference) that were evaluated 14 days after intervention, at ages 1 and 2 months. Secondary variables were clinical side effects.

Results: Fifty-four neonates including 25 girls and 29 boys with mean gestational age of 35.3 ± 1.26 weeks were evaluated. Means of gestational age, birth weight and length of NICU stay were not different in both groups. In the oil massage group, mean weight at ages 1 month (mean \pm SD: 2339 ± 135 vs. 2201 ± 93 g, $P = 0.04$) and 2 months (mean \pm SD: 3301 ± 237 vs. 3005 ± 305 g, $P = 0.005$) was significantly greater than that of the body massage group. No adverse events were seen in the two groups.

Conclusion: Sunflower oil massage might be used as an effective and safe intervention for weight gain in LBW preterm neonates.

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1. Introduction

Low birth weight (LBW or birth weight of less than 2500 g) is one of the main determinants of neonatal and postnatal morbidity [1,2]. According to WHO statistics, the rate of preterm delivery is 8–15% across 184 countries of the world, 8.6% in developed countries and 13.5% in South Eastern Asia and Oceania [3]. Based on the result of one study, LBW rate in Yazd, central city of Iran, is 8.8% [4].

LBW neonates may be admitted to neonatal intensive care unit (NICU) where minimal touch is practiced to avoid acquired infection, although the neonates are then deprived of tactile stimulation. Researchers have reported that moderate pressure massage by a trained person or mother, especially with tactile kinesthetic stimulation, can improve weight gain velocity of LBW infants by different mechanisms such as increase in vagal activity [5–8], increased insulin release [5,6], reduced energy expenditure [9–11], increased gastric motility and better

absorption of nutrients [5,6,11], decreased cortisol and norepinephrine serum level [11] and less stress behavior of neonates [6].

Some other studies have reported that body massage with vegetable oils such as soybean oil [11], coconut oil [6,12–14], sesame oil [15] and safflower oil [14] have increased weight gain velocity of newborns. Darmstadt et al. [16] concluded that sunflower seed oil can be used for prevention of nosocomial infections in very LBW preterm infants in developing countries. Neonates have been massaged with various oils in Asian countries since hundreds of years ago [9]. However, more clinical trials are needed to evaluate the efficacy of different oils and to determine the most effective one. This study was conducted to compare the efficacy of moderate pressure body massage with and without sunflower oil on growth parameters (weight, height and head circumference) of LBW preterm neonates in Iran.

2. Materials and methods

A randomized single-blind clinical, open-label, parallel group study was conducted on LBW neonates admitted to NICU of Shahid Sadoughi Hospital, Yazd, Iran, from March to December 2011. Sample size was based on Z formula and a confidence interval of 95% with 80%

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power, type one error of 5%, with a standard deviation of 2.57 g/kg/day by oil massage in another study [13] and an effect size (difference in weight gain velocity between the two groups) of 3 g/kg/day.

Eligible participants included 60 newborns who had gestational age of 33–37 weeks, birth weight of 1500–1999 g, who were without birth asphyxia and hypoxic ischemic insults, who were less than ten days, were medically stable and did not need any drug therapy and stayed in the hospital for at least 5 days after enrollment in the intervention. Exclusion criteria were multiple pregnancies, sepsis and meningitis, major congenital malformations, small for gestational age (SGA), chromosomal abnormalities, genetic syndromes and serious complications such as intraventricular hemorrhage, severe respiratory distress and necrotizing enterocolitis during NICU admission period. Simple randomization was done by a computer-generated random numbers list, which was prepared by an investigator with no clinical involvement in the trial.

The intervention was delivered by mothers and the primary, and secondary outcomes were assessed by a researcher who was not informed of the intervention group assignment. The investigators, the staff and the participants were all masked to outcome measurements and trial results. The neonates were randomly assigned to two groups to receive moderate pressure body massage or the same massage with 10 ml/kg sunflower oil. The sunflower oil was from the Iran Oil Product Company with the composition of linoleic acid (61.5%), linolenic acid (1.2%), oleic acid (21.5%), stearic acid (7.3%) and palmitic acid (8.5%).

The massages were given three times a day for 14 consecutive days by their mothers. Each mother was trained in the massage procedure in the first day of life by a researcher. The mothers' compliance and the amount of pressure provided were checked twice a week by the researchers during the stay of their newborns at hospital. Mothers continued the massage at home if their neonates were discharged from the hospital before completing the trial. Each massage session was 10 min three times per day (in the morning, at noon and at 10:00 p.m.) for 2 weeks and consisted of two 5-min phases: tactile stimulation during the first and second phases and kinesthetic stimulation during the second phase. In the tactile stimulation phase, the newborn was put in a prone position and stroked with moderate pressure (slight indentations in neonate skin). The infants were massaged for five, 1-min periods (10 strokes at approximately 6 s per stroking motion) over each region in the following sequence:

- (1) from the top of the head to the neck and back to the top of the head
- (2) from the neck across the shoulders to the neck
- (3) from the upper back to the waist and back to the upper back
- (4) from the thigh to the foot to the thigh both legs
- (5) from the shoulder to the hand to the shoulder on both arms.

During the kinesthetic stimulation phase, the infant is placed in a supine position and each arm, then each leg and finally both legs together are flexed and extended. Each flexion/extension motion lasts

10 s for a total of five, 1-min segments [7]. The massage session was temporarily stopped if the infant cried or passed urine or stool until the infant was comfortable again [13].

Growth parameters (weight, height and head circumference) of all neonates were measured at baseline, 14 days after starting the intervention, at 1 and 2 months. All babies were weighted by an infant digital weighing scale with a sensitivity of 10 g without diapers. The scale was calibrated at regular intervals. The supine crown-heel length was measured on the infantometer with the help of an assistant to the nearest millimeter. The weighing scale and infantometer were made by Seca (Germany). Head circumference was measured by a running a flexible non-stretchable tape measure from the supraorbital ridge to the occiput (maximum occipitofrontal circumference). To minimize errors due to interobserver variability, all measurement were made in the Shahid Sadoughi Hospital and by a researcher [1].

The primary measures were mean weight, height and head circumference at the end of the intervention, at 1 and 2 months. Secondary measures were clinical side effects. Baseline variables included age, sex, birth weight, gestational age, route of delivery of the neonate, baseline weight at the start of the study and age and education of mother as recorded from medical records. Gestational age was calculated using the first day of the last normal menstrual period, estimated by obstetric sonography and the Dubowitz scale [4].

The data were analyzed using the Statistical Package for the Social Sciences (version 15; SPSS Inc., Chicago, IL) statistical software. Chi-square test or Fisher exact test was used for data analysis of qualitative variables, and mean values were compared using independent *t*-tests. Differences were considered significant at *P* values less than 0.05. The sample was not sufficiently large to conduct group by repeated measures ANOVAs.

Informed consent was given by the neonates' parents, and the study was approved by the Ethic Committee of Shahid Sadoughi University of Medical Sciences, Yazd, Iran. The researchers did not receive any support from the oil company.

3. Results

Parents of five infants (three infants in massage without oil and two infants in oil massage group) did not return for follow-up, and therefore their infants were excluded from the study. One girl in the oil massage group died at the age of 1 month due to aspiration pneumonia. The final sample of 54 neonates included 25 girls (46.3%) and 29 boys (53.7%) with a mean gestational age of 35.3 ± 1.26 weeks.

The baseline characteristics of the neonates are shown in Table 1. No statistically significant differences were noted between the two groups for gender, mean gestational age, mean birth weight, height and head circumference, baseline weight at the start of the study, length of NICU stay, mother education and age.

Table 1
Baseline characteristics of neonates.

Data	Group			<i>P</i> value
	Oil massage	Massage alone		
Maternal education	Girl	12	13	0.35
	Boy	15	14	
	Illiterate	3	1	0.76
	Primary–secondary school	10	11	
	High school	12	13	
Higher education	2	3		
Gestational age in weeks (mean ± SD)	34.6 ± 1.96	34.5 ± 1.26		0.97
Birth weight in grams (mean ± SD)	1635 ± 124	1721 ± 123		0.41
Birth height in centimeters (mean ± SD)	41.73 ± 1.3	41.62 ± 1.39		0.97
Birth head circumference in centimeters (mean ± SD)	30.4 ± 1.07	30.58 ± 0.66		0.74
Baseline weight at start of study in grams (mean ± SD)	1668 ± 144	1789 ± 104		0.48
Length of NICU stay in days	8.23 ± 1.2	8.7 ± 1.3		0.81
Mother age in years (mean ± SD)	24.5 ± 2.7	24.3 ± 3.5		0.32

Table 2
Mean weight, height and head circumference of neonates 2 weeks after intervention.

Data	Group		
	Oil massage	Massage alone	P value
Weight in grams (mean ± SD)	1884 ± 100	1879 ± 203	0.30 (NS)
Height in centimeters (mean ± SD)	42.77 ± 1.30	42.64 ± 1.38	0.96 (NS)
Head circumference in centimeters (mean ± SD)	31.68 ± 0.78	31.06 ± 1.11	0.21 (NS)

Tables 2, 3 and 4 show mean weight, height and head circumference of neonates at 2 weeks after intervention at the age of 1 and 2 months. The analysis suggested that the mean weight at 1 and 2 months were greater in the oil massage group. No adverse events were noted for either.

4. Discussion

The present study showed that moderate pressure massage with oil was more effective than moderate pressure massage without oil on weight gain of low birth weight preterm infants, which is consistent with the finding of two other Indian studies on oil [12] and coconut oil [13] and with four other Iranian studies using of coconut oil [17,18], oil containing medium chain triglyceride [19] and sesame oil [20]. The study of Sankaranarayanan et al. [13] showed that in LBW preterm neonates, weight gain velocity in 31 days was significantly greater in the coconut oil massage as compared to massage with mineral oil and powder groups. However, in their study, a trained person provided massages four times a day until the neonates were discharged, and after discharge, the massages were given by the mother until the infants were 31 days.

The choice of the oil depends upon the availability, cost and safety [11]. Massage with oil can improve somatic growth [12,13,17–20], skin barrier function and thermoregulation by decrease in the convection losses through skin [11,16], circulation to massaged area [21] and reduce transepidermal water loss [13]. The application of oil in preterm newborns might cause transcutaneous absorption of its fatty acids as a nutritional source [6,14], changes in the fatty acid profiles and increases in serum level of triglyceride and linoleic acid [14,19], greater caloric intake [22], decreased preterm neonates mortality [16] and decrease stress behavior [11,23].

In this study, length and head circumference growth of the infants did not differ across the body massage and body massage with oil groups, which is in agreement to a study on less than 1500 g neonates in New Delhi [12]. In another Indian study, length gain velocity was greater in a coconut oil massage group than a powder group, but no statistically significant difference was observed in length gain velocity between oil massage and massage groups [13]. In another Iranian study, the mean increase in height was significantly greater in a sesame oil massage as compared to control group [20].

Possible explanations for these discrepancies are differences in gestational age, pressure of the massage, person who administered the massage, duration of the massage, etc.

Table 3
Mean weight, height and head circumference of neonates at 1 month.

Data	Group		
	Oil massage	Massage alone	P value
Weight in grams (mean ± SD)	2339 ± 135	2201 ± 93	0.04
Height in centimeters (mean ± SD)	44.94 ± 1.48	44.01 ± 1.27	0.25 (NS)
Head circumference in centimeters (mean ± SD)	32.57 ± 0.79	32.16 ± 0.51	0.20 (NS)

Table 4
Mean weight, height and head circumference of neonates at 2 months.

Data	Group		
	Oil massage	Massage alone	P value
Weight in grams (mean ± SD)	3301 ± 237	3005 ± 305	0.005
Height in centimeters (mean ± SD)	48.3 ± 1.21	48.14 ± 1.25	0.24 (NS)
Head circumference in centimeters (mean ± SD)	33.83 ± 0.8	33.28 ± 0.52	0.14 (NS)

5. Conclusion

The results of this study suggested that body massage with sunflower oil may lead to greater weight gain of low birth weight preterm infants. Sunflower oil massage can be used as a simple, effective and safe non-medical intervention that can increase weight gain velocity of preterm neonates.

Conflict of interest statement

The authors declare no conflict of interest.

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The researchers did not receive financial support from any company or organization.

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